MALARIA IN ZANZIBAR

A STUDY ON ZANZIBARI CULTURAL BARRIERS TO MALARIA PREVENTION AND TREATMENT

A Dissertation

by

ABDULRASUL RAMJI

Submitted to the Office of Graduate and Professional Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PUBLIC HEALTH

Chair of Committee,	Marcia Ory
Committee Members,	Antonio Rene
	Craig Blakely
	James Burdine
Head of Department,	Kenneth McLeroy

May 2014

Major Subject: Health Promotion and Community Health Sciences

ABSTRACT

Despite the World Health Organization promotion of malaria prevention and control guidelines, an estimated 219 million cases of malaria occur worldwide each year. The majority of the 660,000 recorded malaria-related deaths occur in sub-Saharan Africa. Hence, this dissertation focuses on factors affecting malaria prevention and treatment in Zanzibar, Tanzania, one area in sub-Saharan Africa. It reviews current malaria interventions, observes cultural practices that may hinder malaria treatment and prevention, and reflects on current intervention improvement and policy action in Zanzibar.

The introduction sets the stage for malaria as a public health problem in sub-Saharan Africa. The first paper, an initial literature review (N = 36 studies identified), documents what is known about malaria intervention strategies in Zanzibar. Informed by this literature review, the second paper, a key informant study (N = 75 participants interviewed), is conducted to identify cultural barriers to malaria prevention and control. The third paper is a discussion of possible intervention adaptations in consideration of cultural barriers found through the key informant study.

More specifically, the literature review examined 36 peer-reviewed articles of malaria intervention activities in Zanzibar and found no studies on the potential cultural barriers to malaria programs. The key informant study (N = 75) was conducted, and demonstrated four commonly held cultural practices in relation to malaria (1) the use of natural drugs, (2) seeking the aid of traditional healers or witch doctors, (3) the belief in

religious or spiritual thinking, and (4) poorly constructed knowledge or belief about malaria. Finally, the third paper examined Zanzibar's most effective malaria initiative (PMI–President's Malaria Initiative) and recommended adaptations that could help thwart the reemergence of malaria in Zanzibar.

Cultural practices are known to act as barriers, requiring a more comprehensive understanding of how and where cultural practices serve as barriers in specific regions. This dissertation contributes to knowledge about cultural barriers in malaria prevention and treatment not readily known in Zanzibar. A major conclusion is the importance of conducting community regional assessments on cultural practices in the effective promotion of malaria interventions in sub-Saharan Africa.

DEDICATION

To my late mother for her guidance, perseverance and prayers; my late father for being my hero and friend!

To my 8 young grand children whose names are etched on my heart.

ACKNOWLEDGEMENTS

I would like to thank my committee chair, Dr. Marcia Ory for her precise intellectual guidance, and my committee members, Dr. James Burdine for his perpetual encouragement, Dr. Antonio Rene for his academic and literary backing and Dr. Craig Blakely for paving the path to this career and leaving the light on for me to seek guidance at any time. The entire committee's support and guidance throughout the course of this research has been invaluable.

Thanks also go to my friends and colleagues and the department faculty and staff for making my time at Texas A & M Health Science Center's School of Rural Public Health a great experience. I also want to extend my gratitude to the Dr. Zul Premjee at the Aga Khan University Hospital in Nairobi Kenya, who provided support and compliance from the Zanzibar Malaria Control Program at the Ministry of Health Zanzibar, Tanzania. I extend profound gratitude to the Ministry of Health, Zanzibar for making this research possible.

Finally, thanks to my wife, daughters and daughter in law for their support and encouragement and my son Arshad who is my new hero and my best friend.

NOMENCLATURE

WHO	World Health Organization
PMC	Prevention, Management, and Control
IRS	Indoor Residual Spraying
LLINs	Long-Lasting Insecticide treated Nets
ACT	Artemisinin-based Combination Therapy
SP	Sulphadoxine-Pyrimethamine
RDTs	Rapid Diagnostic Tests
MPAC	Malaria Policy Advisory Committee
PMI	President's Malaria Initiative
ZMCP	Zanzibar Malaria Control Programme
MDG	Millennium Development Goal
CCM	Community Case Management

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF TABLES

CHAPTER I

INTRODUCTION

Everyday malaria takes the lives of 2,500 people, according to the World Health Organization (WHO) (2012). Worldwide, in 2010 there were an estimated 219 million cases of malaria leading to 660,000 deaths dispersed among 106 countries (World Malaria Report 2011; WHO, 2011a). Despite the worldwide prominence of malaria, the burden of illness is felt most severely in sub-Saharan Africa. Data indicates that in sub-Saharan Africa a child dies of malaria every minute (WHO, 2011a). With such staggering death estimates, this dissertation sought to assess the status of malaria and specifically focus on a regional area in sub-Saharan Africa with the intention to improve on existing interventions by seeking ways to address cultural barriers and increase the effectiveness of malaria prevention and treatment reach.

Knowledge Gaps

Mwenesi (2005) described progress in understanding behavior, social issues, economics, and policies that hinder malaria control and elimination. In fact, Mwenesi (2005) describes the current knowledge gaps: there still is need of a behavioral change in individuals; lack of concordance between biomedical and explanatory models of disease; synthesis of gender-sensitive interventions; meaningful community participation; and the influence of poverty, human mobility, conflict, and displacement to malaria prevention strategies. Although there are advances in communication, increased methods of communication have not proved to be universally successful in altering behavior toward

adopting malaria prevention strategies. In fact, behavioral change is a long-term process, because it can involve deeply held cultural beliefs and perceptions (Mwenesi, 2005).

Therefore, dedicated attention is essential to meeting these challenges and maintaining progress against malaria elimination and control. Sustained research and development is needed to create a diverse array of treatment and prevention tools; and thus avoid overreliance on a small set of anti-malaria tools, which is risky for effective malaria control because of malaria's adaptability. The world needs more effective policies and increased funding to secure lasting gains against one of humanity's greatest health threats. As a result, the contribution of this study is to evaluate specific regional malaria cultural barriers and provide viable solutions to current malaria prevention and treatment methods in a specific region.

Study Purpose and Aims

The purpose of this dissertation research is to examine the cultural barriers that hinder malaria prevention and treatment in Zanzibar, Tanzania, a region in sub-Saharan Africa. As documented in the literature, cultural practices can act as barriers to seeking appropriate health care treatments (e.g., see Das et al., 2013; Febir et al., 2013; and Ghosh et al., 2012). The overarching research goal guiding this dissertation study is to identify current malaria prevention and control intervention strategies, to better understand cultural barriers to intervention implementation, and to utilize this knowledge to make recommendations on how malaria prevention and treatment activities in Zanzibar might be adapted to address underlying cultural barriers that would otherwise impede intervention efforts.

Our specific lines of inquiry contribute to the study's overarching research goal. Within the three subsequent chapters the following research aims are addressed:

- Chapter 2: Document the current malaria intervention activities in Zanzibar; and identify whether extant literature includes attention to cultural barriers as part of the implementation and dissemination of interventions to eliminate malaria in Zanzibar.
- Chapter 3: Understand the w*hy*, *how*, and *what* cultural practices become barriers to malaria prevention and treatment interventions.
- Chapter 4: Examine global and country specific malaria initiatives, and consider how Zanzibar's most effective malaria initiative might be adapted to take cultural barriers into account to strengthen malaria prevention and control efforts.

This dissertation is formatted in a journal article format with the intention of converting each of the three main chapters into a manuscript. Chapter 1 (Introduction) provides a general overview of the nature of the selected health issue and scope of study. Written with the intention of publication, the main chapters (chapter 2, 3, and 4) can be envisioned as self-contained manuscripts contributing knowledge to the overarching goal. Therefore, Chapters 2, 3, and 4 have different titles compared to the dissertation title. The goal of writing in a journal article format is to provide an outlet for the researcher's chapters to play a vital role in information dissemination through publication. Chapter 5 (Conclusion) provides summary implications drawn from all three studies (Chapter 2, 3, and 4).

This dissertation study contributes to the literature in three ways. First, to the best of the researcher's knowledge no literature review has been conducted describing malaria intervention activities in Zanzibar. Second, the conducted literature review displays the gap in existing peer reviewed literature to comprehensively cover the topic of cultural practices as cultural barriers potentially affecting malaria prevention and control efforts in Zanzibar. Third, since existing literature does not show any programmatic or policy considerations for Zanzibar with the exception of the recent development of the Malaria Policy Advisory Committee (MPAC 2013), this dissertation study makes efforts to reflect on policy issues that can improve existing interventions in Zanzibar.

Scope of the Problem: Malaria in Sub-Saharan Africa

The region with the heaviest malaria burden is sub-Saharan Africa and pregnant women and children under age five are the most susceptible. Sub-Saharan Africa reports 90% of the total malaria related deaths worldwide (WHO, 2012a) and foreshadows what is happening globally. Despite this heavy burden, there are illustrative incremental gains toward malaria elimination (WHO, 2012a). The small successes in sub-Saharan Africa have prompted researchers to discuss final eradication of malaria from the region. Ideally, if malaria could be wiped out from the most burden-felt region, then researchers could work outwardly from such a starting point in order to diminish the remaining influences of malaria. By going into malaria affected regions and investigating the community-wide perceptions of malaria, researchers could draw conclusions between

malaria intervention activities (or treatment and prevention) and community cultural practices.

Zanzibar represents a special case in sub-Saharan Africa. In Zanzibar, malaria estimates are considered low (1%) and investigating the possibility of eradication can help countries witness final steps needed to eliminate malaria. However, there are also concerns that malaria may reemerge as a public health problem. For example, there are already reports concerning mosquitoes building resistance to insecticides (WHO, 2012a). This presents a significant problem because malaria carrying mosquitoes represent a continued spread of the disease. Additionally, forms of resistance (treatment for patients and mosquito resistance) have already emerged as serious potential threats to effective and affordable malaria control.

Determinants

There are several determinants to health in general that are relevant today. The Institute of Medicine (IOM) literature from more than 20 years ago shows the same factors are influential in understanding the behavioral and environmental determinants of malaria treatment in a country (IOM, 1991). For example, the IOM views the following as considerations for researchers: (1) local perceptions of malaria and its causes, (2) the manner in which people decide whether a given treatment or preventive measure is efficacious, (3) patterns of treatment-seeking behavior during episodes of malaria, and (4) the role that the community as a whole plays in planning, implementing, and evaluating the control program (IOM, 1991). The IOM (1991) factors are foundational to unlocking the behavioral barriers to malaria treatment.

In fact, a survey taken by frequent international business travelers from an oil and gas company tested their knowledge, attitudes, and practices toward risk of malaria. The study illustrated that 96% (n = 329) of those who took the survey identified high risk malaria sites and all recognized fever as a malaria symptom. Additionally, 99% continued to take preventative measures toward protection against malaria (Berg et al., 2011). Yet, the inhabitants of malaria stricken regions suffer by not implementing practices toward malaria control. Not understanding fever in the context of malaria has led to accounts of mothers using home-based treatments for their children's fever, thereby postponing medical attention (Kamat, 2006).

Also, the IOM points to population movement, urbanization, and agricultural development patterns as playing the role of determinants related to malaria transmission (IOM, 1998, p. 258). In fact, in 2010 Zanzibar developed the Zanzabar Malaria Control Programme (ZMCP) early detection system to help manage a potential malaria outbreak associated with human population movements. The detection system is vital, because Zanzibar is an island with constant population migration from Tanzania. The ZMCP detection system is used to identify large amounts of malaria cases suddenly occurring and to initiate control measures. Malaria surveillance is key to reducing the potential harm from malaria transmission through human population movement (Pindolia et al., 2012).

Environmental Risk Factors

The mosquito responsible for the most malaria cases (500 million) in Africa is the female *Anopheles gambiae*, which causes approximately 2.7 million deaths a year

with 90% of cases in sub-Saharan Africa (Holt et al., 2002). While in the American continent, the *Anopheles darling* is responsible for causing more than a million malaria cases and specifically more than 500 thousand cases a year in the Amazon basin (Marinotti, et al., 2013).

Agricultural developments have typically involved cutting down rain forests, which has unintentionally created favorable breeding conditions for mosquitoes, since mosquito larvae thrive in sun-lit pools of water, which are often found near agricultural sites (IOM, 1991). Another agricultural risk comes from mosquitoes thriving on the irrigation practices associated with rice production. Much of Zanzibar consists of rural farmland and agricultural practices should take into account of the potential to increase vector influence in an area. While attempts are made through pesticides to eliminate mosquitoes, mosquitoes are adaptive and can develop resistance to pesticides (IOM, 1991). Similarly, the urbanization patterns have created mosquito breeding grounds through stagnant water (IOM, 1991; Pindolia et al., 2012). There is new construction and urbanized planning occurring in Zanzibar, especially concerning the hotel and tourism sector, and construction sites should be mindful of potential spread of mosquitoes due to formed stagnant water pools.

Burden of Malaria

Individuals are diagnosed with malaria, at-risk of getting malaria, and malaria-related illness (e.g., cerebral malaria). One example of a malaria-related illness is cerebral malaria, which has been seen in Malawi and Tanzania. Cerebral malaria is

described as a neurological condition resulting in convulsions (Helitzer-Allen, 1989; Fivawo, 1986).

The people who suffer from malaria and its burden of disease are generally the poor. Yet, malaria's taking of life does not go unnoticed, because reports eventually surface illustrating the mortality rates. Of particular importance to the United Nations is the achievement of Millennium Development Goals 4 (to reduce child mortality) and 5 (to improve maternal health). The continued presence malaria will make these goals hard to achieve (e.g., because of the complexity of administering medication to pregnant mothers).

In relation to the genetics of malaria, Khaireh et al. (2013) described the benefits toward malaria elimination by evaluating the genetic characteristics of *Plasmodium falciparum* (causes malaria in humans) and targeting single malaria strains present in a given region (e.g., Djibouti, sub-Saharan Africa). Further, genetic evaluation analysis can investigate the malaria strains responsible for high morbidity and mortality among sickle cell disease patients (i.e., in Aneni, Hamer, & Gill, 2013) and those infected with cerebral malaria (e.g., Helitzer-Allen, 1989; Fivawo, 1986).

Global Variation

Much of what the IOM perceived in 1991 as a future direction for malaria control and prevention occurred by 2013. Specifically, there is an improved understanding of how people respond to malaria prevention, management, and control. Yet, uncertainty remains about the role that cultural variability plays in the success of malaria control efforts worldwide. The literature recognizes the importance of a group's cultural values

as they impact malaria prevention, management and control measures (e.g., Kenya see Ojakaa et al., 2011; Indian see Das et al., 2013; Ghana see Febir et al., 2013). At best, we can conclude that one effective malaria program in one region will require adaptation to achieve similar impacts in another region/country. In short, not all countries are the same and malaria programs will require tailoring to address the unique cultural variations in different region and communities.

It is disturbing that there is not yet a vaccine for malaria, as this is a critical tool to eradicate the disease. Concerns about smallpox engaged the global community and led to the creation of a vaccine, surveillance strategies, and ultimately containment and the virtual eradication of smallpox on a global scale (Strassburg, 1982). If malaria is not controlled with vaccines, then compared to smallpox, malaria eradication becomes far more challenging (Tynan et al., 2011).

Community engagement in active case detection can further erode the impact of malaria. And the use of preventive activities (e.g., mosquito nets and controlling vector breeding sites) can be effective (Cohen et al., 2009). It has been suggested that these strategies could be sufficient if taken to scale or scaled-up (Greenwood, 2008).

Variation in global malaria prevention and treatment success between different countries can rest on the notion that there is uniqueness of each population group. Activities led by the WHO have established integrated approaches such as the combined use of the following interventions for all malaria affected areas: indoor residual spraying, long-lasting insecticide treated nets, pregnancy and malaria polices (e.g., the use of sulphadoxine-pyrimethamine), treatment (e.g., the use of artemisinin-based combination

therapy), and diagnoses policies. Although malaria programs are similar globally, what separates their impact is how an individual community responds to intervention. From much success due to scale-up interventions and funding, the Malaria Policy Advisory Committee (MPAC) now plays a leading role in guiding policy based on general success from the field (WHO Malaria Policy Advisory Committee and Secretariat, 2013).

Scope of Dissertation Chapters 2-5

Chapter two is a literature review demonstrating current knowledge (as of August, 2013) concerning malaria intervention activities in Zanzibar, with specific attention to cultural barriers reducing intervention impact. The purpose of the review is to reflect on the types of interventions being implemented in Zanzibar reported in literature and barriers to implementation, rather than the effectiveness of interventions per se. The literature review is entitled, "Malaria in Zanzibar: A Review of Malaria Intervention Activities in Zanzibar," and the potential site of publication is the *Malaria Journal*. This publication site was chosen because similar studies were found within the journal.

Chapter three is a key informant study, which collected information from a diverse group of informants including health officials, district/zone health officers, medical doctors and related clinical staff, and community leaders and members. Listening to what key informants have to say about the prevalence of malaria in Zanzibar, common prevention methods, and beliefs about the causes of, and treatments for, malaria increases our understanding of how cultural practices can impact malaria prevention and control efforts. This study, "Malaria in Zanzibar: A Key Informant Study

into the Description of Cultural Barriers Related to Malaria Prevention and Treatment in Zanzibar," has a potential publication site in the *Malaria Journal*. The specific health issue of malaria in chapter three is well suited for the publication site.

Chapter four is a policy focused paper that reflects on Zanzibar's current malaria eradication initiative (August 2013). Based on knowledge of underlying cultural beliefs about the etiology of and treatment for malaria, this paper offers recommendations to enhancing Zanzibar's current malaria treatment and prevention methods. Chapter four is entitled, "Policy Reflection in Zanzibar: A study into Enhancing Existing Malaria Interventions in Zanzibar," and has a publication potential in the *Malaria Journal*. The specificity of chapter four addressing malaria issues fits well with the *Malaria Journal*.

Chapter five serves to bring all the research together and is the final chapter. In chapter five the findings are summarized and implications are discussed. Further synthesizing of information in chapter five also serves to illuminate mechanisms for change. Recommendations for empowering Zanzibar's current malaria initiatives are also restated.

Genesis of the Research

Born in Kenya and with a wealth of experience in addressing healthcare issues in different countries, I developed a natural passion for global health issues. In formulating this research study, I wanted to address a major concern in Africa. Conversing with several esteemed colleagues, it was the ideas of Dr. Zul Premjee that led me to decide on my research topic–cultural practices that become barriers to malaria treatment and prevention.

My research topic became a self-funded study to inform how regional cultural practices influence current malaria treatment and prevention methods. With the guidance of Dr. Zul Premjee, I realized the importance of identifying what governments need to know help sustain malaria prevention and control efforts. Dr. Premjee was instrumental in helping me with the logistics, practicality, and feasibility of study these issues in sub-Saharan Africa. In conversations with government officials I gravitated toward Tanzania, more specifically, Unguja Island of Zanzibar, as my ideal location for research.

CHAPTER II

MALARIA IN ZANZIBAR: A REVIEW OF MALARIA INTERVENTION ACTIVITIES IN ZANZIBAR

The World Health Organization's (WHO) 2012 World Malaria Report (WHO, 2012a) found that malaria rates have been decreasing in sub-Saharan Africa. Between 2000 to 2010 malaria mortality rates decreased by 25% globally and 33% in Africa, according to WHO. Much of this success can be attributed to the malaria prevention and control goals established by the World Health Assembly in partnership with the Roll Back Malaria (RBM) program that set a goal of reduction of malaria deaths and cases by 50% for 2010 and 75% by 2015 (WHO, 2010). Although the death toll of children is still in the millions, malaria deaths and cases have been declining. Worldwide, the mortality of children under five-years-old from malaria declined from 11.9 million in 1990 to 7.7 million in 2010 (Rajaratnam et al., 2010). Of these deaths, approximately 50% occurred in sub-Saharan Africa.

Global variation in malaria prevention among different countries rests on the uniqueness of each population. Activities led by the WHO have established integrated interventions for all malaria endemic areas including Indoor residual spraying, long-lasting insecticide-treated nets, pregnancy and malaria policies (e.g., the use of sulphadoxine-pyrimethamine treatment), the use of artemisinin-based combination therapy, and rapid diagnostic test policies (MPAC, 2013). Although malaria programs

are similar in most countries, what separates their impact is how the individual community responds to the intervention.

Zanzibar has also experienced a decrease in malaria cases and malaria deaths (McElroy, n.d.; ZMCP, n.d.). One study found an increase in the number of effective interventions at in-patient health facilities in Zanzibar, which led to decreases in malaria deaths for all age groups (Aregawi et al., 2011). Among children under age five, the decrease was from an annual average of 46% in 1999 through 2003 to 12% in 2008.

Although malaria has declined to in Zanzibar, the Ministry of Health continues to review strategies in order to prevent this trend from reversing. The Ministry of Health and health officials of Zanzibar have begun to evaluate the general success of the Zanzibar Malaria Control Program (ZMCP) (McElroy, n.d.; Ali, n.d.). In fact, the ZMCP seeks to inform and guide the Ministry of Health and Social Welfare toward malaria control and elimination. The Unites States has also provided resources in the form of the interagency The President's Malaria Initiative to support Zanzibar's effort toward malaria elimination.

History of Malaria Prevention Activities

Malaria control programs in Zanzibar began to be highly effective in the 1960s. However, programs were eliminated before the decade ended. This resulted in the return of malaria to the islands. During the 1980s the disease became the leading cause of death, and continued to be a major public health problem for the next 20 years. By 2003, malaria ranked first in morbidity and mortality and was responsible for approximately 40% of all outpatient consultations at health care facilities (Tanzania National Bureau of

Statistics and ORC Macro, 2005).

The treatment regimen for 2003 was chloroquine, an intervention method that failed in 60% of cases. In 2006 the Zanzibar government, with resources from the African Development Bank, changed the treatment method from chloroquine to artemisinin-based combination therapies and introduced a dual approach of indoor residual spraying programs and the insecticide-treated nets distribution to expectant mothers and to households with children younger than age five (Bhattarai et al., 2007). These interventions proved to be successful by radically reducing the disease in recent years.

In June 2005, the islands of Zanzibar were selected to join the newly formed U.S. President's Malaria Initiative (PMI, n.d.b), provided funding to maintain the advances secured by the Zanzibar Malaria Control Program (ZMCP) through the use of artemisinin-based combination therapies s and insecticide-treated nets by focusing on increasing the number of persons with access to these interventions. In addition, the President's Malaria Initiative provided resources to sustain indoor residual spraying, creating the most comprehensive malaria prevention and control programs in Zanzibar. According to ZMCP 2007 data, approximately 80% of households in Zanzibar possessed at least one insecticide-treated net or long-lasting insecticidal net (ZNMCP, 2007). The two-prong approach of providing free artemisinin-based combination therapies and insecticide-treated nets reduced malaria-related mortality among children under age five by 75% between 2002 and 2005 (Bhattarai et al., 2007).

A new treatment regimen was also introduced in 2005. The WHO provided

artesunate/amodiaquine fixed-dose combination blister packs to be used as a first-line treatment of malaria. These treatments were supplied to all public health and healthcare facilities and administered at no cost to patients with a confirmed diagnosis of malaria.

Rapid diagnostic tests were piloted in Zanzibar to facilitate this policy change, under a joint program of the ZMCP and other national and international organizations including the Karolinska Institute through its Zanzibar Malaria Research Unit, the WHO, and Doctors without Borders (Médecins Sans Frontières) (Bhattarai et al., 2007). The U.S. President's Malaria Initiative provided 100,000 RDTs for public health facilities through 2007 (PMI, n.d.b). Ninety-five percent of healthcare facilities in Zanzibar were found to have either microscopy or RDTs available to confirm malaria diagnoses (Africa Fighting Malaria, 2008).

Currently there is a lack of data on population migration between mainland Tanzania and Zanzibar. The concern is that individuals travelling from mainland to Zanzibar, a 20-mile journey, will likely import the disease. Since not all of the population of Tanzania has adopted malaria prevention strategies there is a concern that population migration might lead to malaria outbreaks.

Malaria screening of the Zanzibar population will become increasingly important as the prevalence of the disease approaches zero, because the population will might lose their natural immunity to the disease.

Malaria control in Zanzibar does present some new challenges. For example, a strategy broadly applied in endemic settings, the presumptive treatment of fever with anti-malarials, should be reviewed and modified. Fever cases among adults and children

are not likely to be caused by malaria. The government will need to decide how to proceed with the malaria prevention and control interventions and the best methods to address new epidemics of malaria.

Malaria control program officers will also need to determine how to sustain a malaria-free Zanzibar. The current set of vector control tools and treatments methods should be able to eliminate malaria on the island. However, in sub-Saharan Africa, the fear for many malaria vector control programs is that mosquitoes carrying malaria are increasingly developing resistance to insecticides (Ranson et al., 2010; Coetzee & Koekemoer, 2013).

The most common insecticides for malaria vector control are pyrethroids. These insecticides are the only one used for LLINs, but their effectiveness is being challenged by the emergence of resistance (Hargreaves et al., 2000; Tripet et al., 2007; Djènontin et al., 2009; Hunt et al., 2011; Koekemoer et al., 2011; Norris et al., 2011). Monitoring the susceptibility of vectors to insecticides is therefore essential for predicting the sustainability and efficacy of these control tools (Morgan et al., 2010). In the past, mosquitoes from Unguja, the larger of the two main islands of Zanzibar were susceptible, but resistance was restricted to the island of Pemba (Jones et al., 2013).

Methods

This literature review sought to combine both a summary and synthesis of scholarly articles, books, and other sources relevant to malaria interventions and socio-cultural research in Zanzibar, Tanzania providing a description, summary, and an

evaluation of each work. Its intent is to offer an overview of significant literature published on malaria prevention and treatment interventions.

Socio-Cultural Review

A title and abstract search within the PubMed database was conducted. The Boolean search terms were *malaria* and *Zanzibar*. Search terms were purposely broad in order to identify all possible intervention activities in Zanzibar, which then allowed for a secondary search for documents that explicitly described cultural practices in relation to malaria prevention and treatment. The PubMed search resulted in 48 studies. Searches within the Cochrane Summaries and the Embase database were also conducted. The former yielded 54 reviews and the latter 78 studies. Studies from Cochrane Summaries served to validate malaria's current trend and status in Zanzibar. Studies were included only if all criteria measures were satisfied (see coding sheet, Appendix). Because conditions change over time, studies published before 2003 were excluded.

Inclusion/Exclusion Criteria

Studies were included only if all criteria measures were satisfied (see Systematic Review Protocol Coding Sheet, Appendix A). The studies had to be empirical, because the purpose of this systematic review was to address components related to outcomes from malaria interventions. As a result, articles consisted of intervention activities in Zanzibar compared to theoretical or commentary studies on Zanzibar. Language was not a criterion. Also, because conditions change over time, studies published before 2003 were excluded.

Study Selection

Following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses; Liberati et al., 2009) standards, this study evaluated the search results (Figure 1). For instance, PRISMA calls for four phases to ensure a complete sampling of relevant studies: Identification, screening, eligibility, and inclusion (Moher et al., 2009). The PRISMA standards accommodate the first six steps in the systematic review process (Torgerson, 2003).

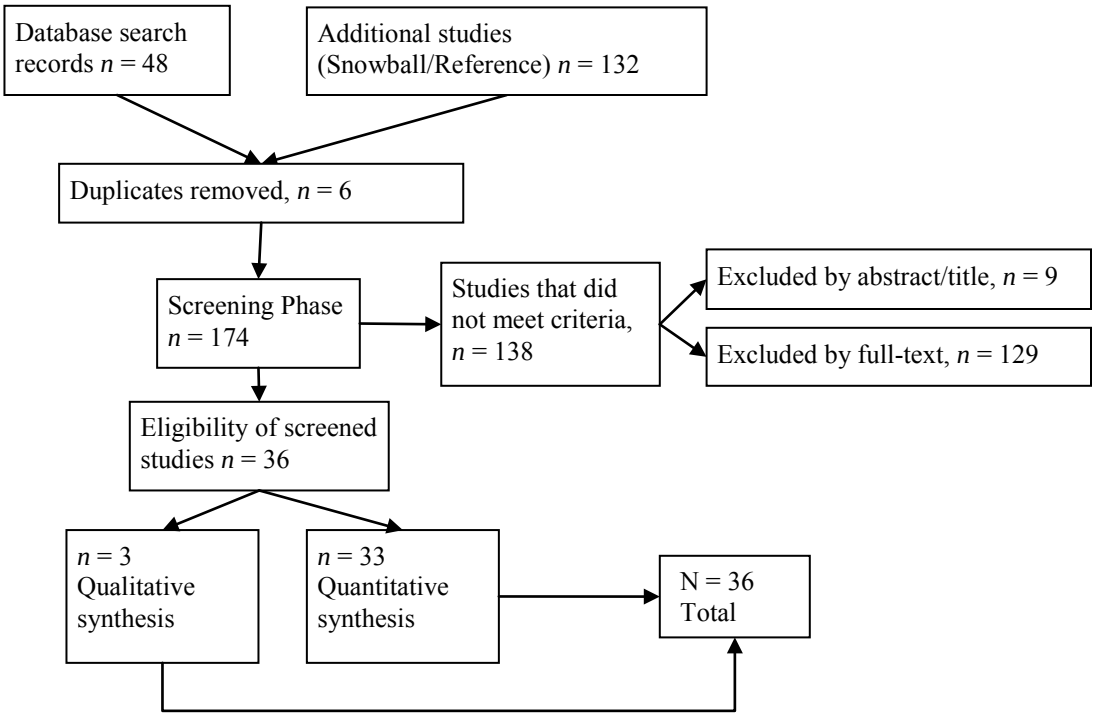

Figure 1. PRISMA Study Selection Process (Moher et al., 2009).

In the identification phase, one gathers all studies that are found through the use of search terms, in this case *malaria* in *Zanzibar*. After removal of duplicate studies, the

screening phase followed a two-part evaluation method. First, abstract and title screening filtered out nine studies. Second, a full-text review screening removed 129 studies. After full-text review of each study, the sample size was 36 studies, which also included the eligibility phase. All eligible studies (36) were categorized as qualitative (3) and quantitative (32). During the screening and extraction process, two raters discussed their rationale for accepting or rejecting a study followed by examining each other's data entry on the systematic review protocol. Inter-rater reliability between raters was reached through consensus.

Results

Of the 36 studies found, the most frequent publication year was 2012 (seven studies). Ten were published in the *Malaria Journal. Tropical Medicine and International Health* journal carried five studies. The other studies in this review spanned across 12 other journals. Also, there was a wide range of intervention activity related to malaria, which are organized in a matrix (Table 1). In Table 1, the intervention activity is summarized form each study and any barriers described by authors were noted in the last column (Barriers to interventions or concerns).

Table 1

Matrix of Malaria Topics and Intervention Activities in Zanzibar

Table 1 Continued

	First author, year	Malaria topic	Intervention activity	Barriers to interventions or concerns
1	Morris et al., 2013	Molecular surveillance	RDT-DNA extraction	*
2	Bauch et al., 2013	Malaria transmission	LLINs, indoor residual spraying (IRS), and malaria education	Lack of staff at clinics, too few LLINs distributed, inadequate malaria education
3	Beer et al., 2013	Vector control	Bed nets, IRS	*
4	Baltzell et al., 2013	Diagnostic testing	RDTs evaluation toward diagnosing malaria infection	Human malaria species that are not picked up by diagnostic testing
5	Talisuna et al., 2012	Affordable medicine	Affordable Medicines Facility-malaria (AMFm), ACT	Depletion of resources
6	Tougher et al., 2012	Affordable medicine	AMFm, ACT	*
7	Fröberg et al., 2012	ASAQ	ACT	*
8	Beer et al., 2012	Bed net perception	Bed net usage	Bed net cost and usage during the hot season
9	Kaufman et al., 2012	Acceptance and rejection of IRS	IRS (Indoor Residual Spraying)	Attitudes and misconceptions related to IRS
10	Gosoniu et al., 2012	Spatial burden estimates	Bayesian geostatistical modeling	*

Table 1 Continued

	First author, year	Malaria topic	Intervention activity	Barriers to interventions or concerns
11	Cavaco et al., 2012	AQ	ACT	*
12	Smith et al., 2011	Malaria funding	Sustained funding	Decline in funding
13	Aregawi et al., 2011	Scale-up initiatives	ITN (LLINs), IRS, ACT, and SP-IPTp (intermittent preventive treatment with sulphadoxine-pyrimethamine for pregnant women)	*
14	Valecha et al., 2010	Drug resistance	Arterolane–a potential alternative to artemisinin derivative in ACT	*
15	Beer et al., 2010	ITN, LLIN	Mass distribution of free LLINs to children under five and pregnant women	Mass distribution without providing communities with information, education, and communication
16	Jaenisch et al., 2010	Decline in malaria transmission before interventions	Illustrates a decline in malaria before ACT, ITNs, and IRS on the Zanzibar Archipelago	*
17	Tatem et al., 2009	Human movement patterns	Mobile phone data patterns	*
18	Beer et al., 2009	Non-adherence to drugs (artesunate-amodiaaquine, AsAq)	Call for dose-specific packaging for infants, clear instructions, and first-dose demonstration	Misunderstanding or forgetting the correct dose regimen

Table 1 Continued

	First author, year	Malaria topic	Intervention activity	Barriers to interventions or concerns
19	Msellem et al., 2009	Diagnostic efficiency	Malaria Rapid Diagnostic Tests	*
20	Sousa-Figueiredo et al., 2008	Malaria parasitological survey	*Kick-out-Kichocho,* an integrated helminth-control initiative	Reduce burden of urinary schistosomiasis and soil-transmitted helminthiases
21	Stoltzfus et al., 2007	Effect of iron-deficiency in young children	Intervention strategy: Iron supplementation	Cost and logistics of screening for resource-poor areas
22	Ferreira et al., 2008	Single nucleotide polymorphisms (SNPs)	ACT (Artemisinin-based Combination Therapy)	*
23	Bhattarai et al., 2007	Roll Back Malaria	ACT, LLINs	*
24	Sisowath et al., 2007	Treatment resistance	Artemether-lumefantrine (AL) for combination therapy	*
25	Sazawal et al., 2007	Zinc supplementation on mortality in children (1-48 months)	Zinc supplementation	Overall there was no statistically significant (p=0.24) trends for lower mortality due to malaria for children (1-36 months; N=42,546) in the study
26	Stothard et al., 2006	Educational efforts	Health education study: booklet *Juma na kichocho*	Majority of children failed to realize that re-infection could occur after treatment

Table 1 Continued

	First author, year	Malaria topic	Intervention activity	Barriers to interventions or concerns
27	Iannotti et al., 2006	Effect of iron deficiency in early childhood	Iron supplementation	Greater risk of serious adverse events from malaria + iron folic acid
28	Sazawal et al., 2006	Effect of iron deficiency in children younger than age 5	Iron supplementation	Iron and folic acid in areas of high malaria transmission is harmful
29	Lemnge et al., 2005	Parasitological resistance	Efficacy of sulfadoxine-pyrimethamine (SP) and amodiaquine (AQ)	*
30	Mårtensson et al., 2005	Clinical trial	Efficacy of ASAQ and artemether-lumefantrine (AL)–ACT	Comparison of different ACTs
31	Cusick et al., 2005	Vitamin A	Effects of Vitamin A and SP on erythropoietin production in severely anemic preschoolers	Vitamin A lowered erythropoietin concentration
32	Cavaco et al., 2005	Main alleles of malaria (CYP2C8)	Frequencies of CYP2C8, a main metabolizer of amodiaquine (anitmalarial)	AQ toxicity related to quinoneimine
33	Sisowath et al., 2005	Clinical trial	ACT	Resistance to artemisinin
34	Mebrahtu et al., 2004	Iron deficiency	Low-dose iron supplementation	Malaria infection was not increased
35	Mabaso et al., 2004	IRS	IRS	Insecticide resistance

Table 1 Continued

	First author, year	Malaria topic	Intervention activity	Barriers to interventions or concerns
36	East African Network for Monitoring Antimalarial Treatment (EANMAT), 2003	Antimalarial drug policy	SP (Sulfadoxine-Pyrimethamine), ACT (Artemisinin-based Combination Therapy)	*

Note. IRS = Indoor residual spraying; ITN = Insecticide Treated Nets; Long-Lasting Insecticidal treated Nets (LLIN); ACT = Artemisinin Combination Therapy; AQ = Amodiaquine; ASAQ = Artesunate-amodiaquine

* = barriers or consequences were not explicitly stated in the study

Cultural Barriers

Although no cultural barriers were identified in this review for Zanzibar, there are studies that have taken place in sub-Saharan Africa describing the notion of cultural barriers. For instance, Jombo et al. reported that the continued persistence of malaria in Africa appears to be largely due to socio-cultural factors, which are often at variance with standard control methods. Jombo's study was designed to ascertain the socio-cultural factors affecting the control of malaria in an endemic city–Makurdi, Nigeria (Jombo et al., 2010). The study was cross-sectional in nature using systematic sampling methods to identify households from which both quantitative and qualitative data were collected from adult women using structured and semi-structured questionnaires, and focus group discussions. Questionnaires were administered requesting age, educational level, marital status, malaria awareness, and prevention. Focus group discussions were used to obtain qualitative information not captured in the questionnaires. Data obtained was analyzed using Epi Info 6 statistical software. Of the 2,075 adult women studied, 97% (n=2,013) were aware of the existence of malaria. Out of these, 83% (n=1,671) did not consider malaria to be a serious health problem that would need urgent attention. Educational level and marriage had a positive impact on knowledge about the disease ($p<0.05$). Accessibility to information on malaria and general knowledge of the modes of transmission and control was generally low, and to a large extent influenced by cultural beliefs, values, and economic status. Jombo et al. (2010) concluded there was a need to intensify adult health education and that home health educators should be utilized to increase knowledge about the disease.

Priority on Allocation of Financial Resources

Good data and information on health expenditures in Zanzibar is scarce and not up-to-date. The latest information available comes from the Zanzibar Health Sector Public Expenditure Review of 2006 (ZHSPER) (International Labour Office, Social Security Department Zanzibar, 2010). According to the ZHSPER, recurrent health expenditure from year 2000/2001 to 2005/2006 represents about 7% of the government recurrent expenditure. In 2008 the malaria control per capita expenditure for Tanzania is $.80 USD (PMI, n.d.c). Activities related to malaria prevention rely highly on external support such as Global Fund and Presidential Malaria Initiative (PMI, n.d.a). This is critical in terms of sustainability for malaria interventions such as procurement of bed nets, indoor residual spraying, and community mobilization because not all individuals can afford these prevention strategies.

The Household Budget Survey indicated that around 2.1% per capita was spent on health care within 28 days in 2004/05 (International Labour Office, Social Security Department Zanzibar, 2010). Zanzibar health care services are provided in terms of cost-sharing or proving services to citizens at a lower cost. There is relatively little data on out-of-pocket spending by households on health services. However, high cost for individual spending on malaria impedes the overall prevention and treatment from the disease because of individuals in poverty.

Socio-Cultural Factors

In recent years emphasis has been placed in investigating socio-cultural factors that influence health-seeking behavior for malaria and cause delay in utilizing health

facilities (Tanner & Vlassoff, 1998). The beliefs and cultural practices of patients are largely related to the success of a malaria control program (PMI, n.d.a). Williams and Jones (2004) conducted a literature review on behavioral issues related to malaria control in sub-Saharan Africa (Williams & Jones, 2004). In their study health care providers reported cultural practices related to malaria in some regions of Zanzibar: 1) Newborns may be vaccinated in a timely manner (considered a common practice); 2) Women do not make decisions concerning their children (considered a social barrier); 3) Herbal medicine use is a generational tradition (considered a cultural factor); and 4) Sickness is caused by the gods (considered a belief factor).

Control of malaria in sub-Saharan African communities requires knowledge of the modes of spread and the factors that enhance its control and prevention by the population of the affected region. An ethnographic study of childhood malaria in southeastern Tanzania revealed that individuals made a clear distinction between 'normal malaria' and 'cerebral malaria' characterized by convulsions (Hausmann-Muela et al., 1998). Actually, a convulsed child in a health facility is highly likely to be taken to a traditional healer in preference to any other health service. Malaria with convulsion in children seems to be perceived differently in some households. Most of the people called it “degedege”, with popular beliefs regarding evil spirits or demons attacking the child. Parents often do not seek care at health facilities when their children experience this symptom, instead they rely on traditional healers for treating the children with severe malaria (Nsimba & Kayombo, 2008). It has been suggested that in chronic or fatal illnesses, when symptoms change abruptly or when treatment does not provide the

expected results, suspicion of witchcraft or spirits can emerge (Makundi et al., 2006). Religious beliefs can also deter individuals from receiving malaria vaccine.

In Tanzania, as in most sub-Saharan Africa, prompt case diagnosis and effective treatment is the main control strategy for malaria. The government has made deliberate and successful efforts to make healthcare services accessible to the majority of rural communities. However, this does not guarantee that all patients utilize the services when they fall ill. Since malaria may present in different forms such as convulsions, altered consciousness, or coma, community perception of underlying causes may differ. Consequently, many patients with these conditions turn to traditional healers prior to seeking modern healthcare resulting in delay in effective treatment. Additional if modern medicine does not provide the expected results, suspicions of witchcraft or spirits can emerge (Makundi et al., 2006).

Vitamins and Supplements

Results from this review identified five studies on mineral supplements and one on vitamins pertaining to intervention activities in Zanzibar. Early research to identify viable solutions for malaria treatment through vitamin and mineral supplements resulted in the investigation into the effects of vitamin A, zinc, and iron. These three were hypothesized to work against malaria infection. However, vitamin A lowered erythropoietin concentration, which was not idea for malaria prevention (Cusick et al., 2005). Sazawal et al. (2007) found zinc to not have overall statistically significant (p = 0.24) trends for lower mortality due to malaria for children (1-36 months; N=42,546). There by, resulting in a loss of interest in zinc supplements.

Iron has also not proven useful against malaria. There was controversy that iron actually increased malaria infection, however Mebrahtu et al. (2004) claimed this was not the case. Yet Iannotti et al. (2006) and Sazawal et al. (2006) began to find harmful effects of iron and folic acid supplementation that resulted in increased malaria risk. A cost analysis of iron and folic acid therapy to children in Nepal and Zanzibar found increased adverse affects to children who were not iron deficient (Stoltzfus et al. (2007). The study concluded that strategies to improve iron supplement therapies were needed where the health systems were second-rate. The use of vitamin A, zinc, and iron is now overshadowed by educational outreach interventions, such as the Zanzibar School Malaria Program, which helped students to get information and skills on malaria control prevention and informed them on symptoms and treatment of the disease (Ssengozi & Makumbi, 2010).

Customary Interventions

The four most commonly described malaria prevention and treatment interventions in Zanzibar identified in the literature were indoor residual spraying, long-lasting insecticide treated nets, insecticide treated nets (ITN), sulphadoxine-pyrimethamine, and Artemisinin-based combination therapy). These were addressed in 23 studies. The use of sulphadoxine-pyrimethamine is related to malaria programs that target pregnant mothers since the fetus can contract malaria if the mother is infected. Artemisinin-based combination therapy treatment is the most widely used form malaria treatment. However, a diagnosis has to confirm malaria infection before treatment can be administered. Rapid diagnostic tests and microscopy are the most common form of

diagnostic testing.

Scale-up initiatives, such as the President's Malaria Initiative, are addressed in the literature to a lesser degree than treatment. This type of initiative, popular with government entities, involves taking the most effective interventions known and increasing reach. Such scale-up interventions can be identified on governmental websites and reports (e.g., ZMCP website), yet they elude academic discourse when scale-up activities are not found in peer-reviewed literature. Although scale-ups initiatives are promoted globally, little is described of how scaled-up interventions integrate well with other approaches to improve monetary efficiency of outcomes compared to simply allocating monetary funds to increase treatment and interventions reach.

Skilled Personnel

Controlling material requires a competent health workforce. The shortage of staff in most primary health facilities remains a challenge in Tanzania. Primary health facilities are often headed by unskilled personnel, thus most of the health practices that aim to combat malaria are poor in terms of reporting, confirmation, response, and control are poor. For example, "Poor staining and slide techniques or categorization errors by the laboratory technicians may have led to over reporting of positive or negative blood smears, reducing rapid diagnostic test sensitivity and specification" (McMorrow et al., 2008).

Barriers

Review of studies identified the following barriers: lack of education about malaria, lack of funding and other resources, and lack of qualified staff to diagnose and

treat malaria. The described barriers are also illustrative in Table 1. Intervention barriers generally exhibit a need for education and funding. More funding should go into better training, since training has not sufficed (Bauch et al., 2013). Specifically, if Zanzibar is to eliminate malaria, funding is required for educating health professionals and the community; these two areas emerge from the literature. Although, additional studies do explore the in-depth molecular mechanism of Artemisinin-based combination therapy, these studies were excluded if there was not tied to intervention activity. In other words, Artemisinin-based combination therapy is recognized as effective, and the specific molecular information within the therapy was not the focus of this study.

Discussion

The main findings of this review indicate more quantitative studies (33) in the literature as compared to qualitative. Of these quantitative studies, four interventions were reported to be successful (indoor residual spraying, long-lasting insecticide treated nets, Artemisinin-based combination therapy, and sulphadoxine-pyrimethamine use). Additionally, effectiveness of these interventions was increased when they were used simultaneously.

Vector control programs have eradicated malaria from several other nations. However, vector control in Zanzibar is different because the country's tropical environment, which is ideal for vector breeding. Therefore, additional vector control was sought in the form of bed nets and in-house spraying coupled with diagnostic and therapeutic improvements, such as Artemisinin-based combination therapy and rapid diagnostic tests. In conjunction with vector control and malaria case prevention,

Zanzibar has constructed a surveillance system to monitor the malaria outbreaks (ZMCP, 2010).

The most effective interventions in Zanzibar are integrated as an initiative, generally involving indoor residual spraying, long-lasting insecticide treated nets, sulphadoxine-pyrimethamine to treat pregnant women for malaria, rapid diagnostic tests, and Artemisinin-based combination therapies (WHO, 2011a; MPAC, 2013).

Although this literature review only identified one study in Zanzibar describing a scale-up initiative, the finding is significant because a scale-up initiative makes use of proven interventions and increases intervention reach. The Tanzanian government initiates scale-up interventions because of funding requirements. However, non-government entities such as the Gates Foundation have participated and advocated for malaria eradication (Roberts & Enserink, 2007).

Further education about malaria is necessary to prevent, control and eliminate the disease. Findings from this review indicate a lack of education, funding, and available trained staff are barriers to addressing primary factors in malaria control and prevention. Intervention initiatives are dependent on large sums of monetary financing. For this reason there are issues related to long-term financing and sustainability (Gulland, 2012).

Given that funding is limited and dependent on global economics, the other two identified barriers of malaria prevention can be evaluated for potential solutions. For instance, educational programs can be implemented to help the community understand malaria and contribute to prevention and control. Such action plans are reported in the Ministry of Health in Zanzibar (Revolutionary Government of Zanzibar, Ministry of

Health, 2011). Also, the Ministry of Health is aware of the need of clinical training to improve malaria diagnoses and treatment. While the literature identifies the barriers, Zanzibar is responding through the Malaria Policy Advisory Committee and Secretariat (MPAC, 2012; MPAC 2012b; MPAC 2013) and ZMCP (2010).

One aspect not well addressed is how cultural practices impact malaria prevention and treatment programs. Only 8% of the qualitative studies mentioned Zanzibar's cultural/social/belief aspects of malaria. These studies revealed that researchers were evaluating constructs such as the perceptions of malaria (e.g., MPAC, 2012b; MPAC, 2013). Additionally, Kaufman et al. (2012) used a qualitative approach to identify attitudes and misconceptions related to indoor residual spraying acceptance or refusal (Kaufman et al., 2012). Although not entirely focused on cultural practices, these studies provide insight into the social and belief systems of individuals that can be barriers to malaria control and prevention programs. Therefore, investigating specific cultural practices in Zanzibar by using a qualitative approach could shed light into underlying causes for why individuals disregard current malaria control and prevention programs; adding to the literature further successful methods for in prevention and control.

In summary, many studies were identified in this literature review as contributing to intervention activities for malaria prevention and treatment (see Figure 2). The description of preventive strategies such as indoor residual spraying, long-lasting insecticide-treated nets, and surveillance emerged as the widely observed strategy in the literature. Drug studies/clinical trials seemed to dominate the literature related to

treatment. From the systematic review findings, the effectiveness of indoor residual spraying, long-lasting insecticide-treated nets, artemisinin-based combination therapy rapid diagnostic tests, and malaria policies, along with use of scale-up initiatives, reflected the breath of quantitative studies. What the qualitative studies brought forth were the notion of cultural practices and their possible influence on malaria prevention and treatment.

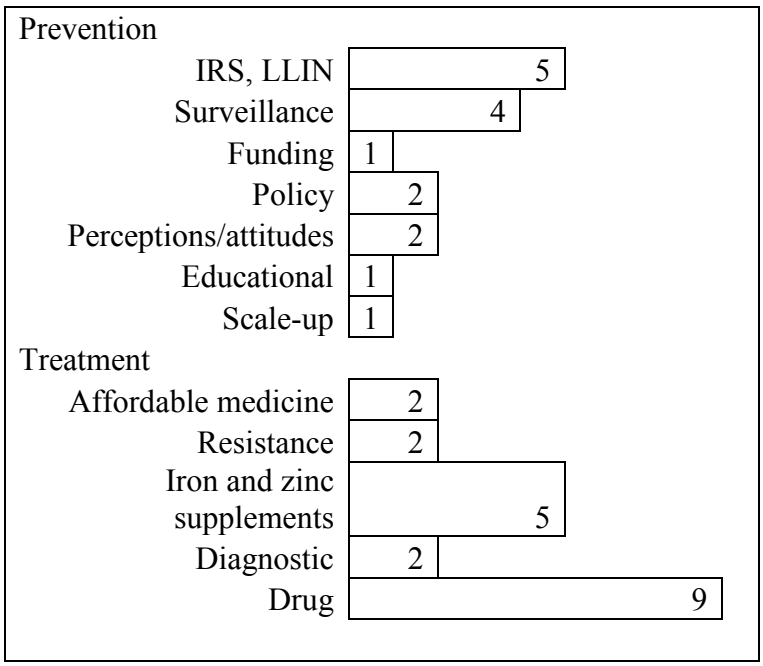

Figure 2. Distribution of Studies by Sub-Categories

The identification of cultural practices in Zanzibar can be of value, because in other countries, such as Ghana and Kenya, some cultural practices reduce the impact of malaria programs (Febir et al., 2013; Ojakaa et al., 2011). This systematic literature review on malaria in Zanzibar demonstrates the lack of information concerning cultural

practices and how they affect malaria programs (e.g., no study explicitly addressed the influence of cultural practices from Table 1), which is a limitation of the literature. Therefore, research in community cultural practices has the potential to increase the overall understanding of improved effectiveness in integrated scale-up initiatives currently established in Zanzibar.

Conclusion

This investigation suggests that the integration of culture practices into malaria control strategies may substantially increase the impact of those interventions at the community level. For instance, Panter-Brick et al. (2006) conducted a study to repair bed nets (i.e., reduce the spread of malaria from mosquito bites) involving the use of song in rural Gambia in order to instill malaria prevention strategies into the culture (Pankter-Brick et al., 2006). The purpose of the study was to train the next generation of children to accept malaria control and prevention strategies as culture through song (Pankter-Brick et al., 2006). Such interventions allow malaria prevention strategies to have greater impact on the community.

Current tools and treatments are insufficient to eliminate malaria. In fact, malaria can rebound quickly as the parasites develop resistance to currently available insecticides and treatments. There have long been concerns with mosquitoes building resistance to insecticides. Therefore, innovation is essential to meeting these challenges and maintaining progress against malaria. Sustained research and development is needed to create a diverse array of treatment and prevention tools; and thus, avoid overreliance on a small set of anti-malaria tools, which is risky for effective malaria control because

of malaria's adaptability. The world needs more effective policies and increased funding to secure lasting gains against one of humanity's greatest health threats. To date, the Gates Foundation has contributed $2 billion toward malaria research and development (Roberts & Enserink, 2007).

This review of summarizes malaria intervention activity conducted in Zanzibar as described in professional literature. Observational speaking, intervention activity in Zanzibar is also defined and guided by similar global initiatives, such as the WHO Malaria Policy Advisory Committee and Secretariat (MPAC, 2013). What is known about progress toward malaria control and elimination is that the integrated and scale-up use of indoor residual spraying, long-lasting insecticide-treated nets sulphadoxine-pyrimethamine treatment, artemisinin-based combination therapy, and rapid diagnostic tests is highly encouraged. Additionally, the WHO has expressed integration and scale-up initiatives to strengthen effective interventions. The focus into integration allows researchers to build and add new interventions onto effective interventions to ultimately reach malaria eradication. However, little is still known concerning the impact cultural practices have on the effectiveness of malaria programs.

It is clear that addressing health determinants for malaria control in Zanzibar remains a challenge. Financial sustainability is the main key area for policy makers to consider in combating malaria in the island. Improvement of health care services for effective prevention and management of the disease requires high skilled personnel for better decision-making process. More funding should be allocated for training, since current levels of training has not sufficed to increase skill levels (Ng'ang'a et al., 2009).

Specifically, if Zanzibar is to eliminate malaria, funding is required to educate health professionals and the community. Many challenges still impede the control of the disease in Zanzibar. Socioeconomic status and cultural issues should be a consideration in long term national strategies.

Limitations

There have been few systematic reviews of malaria related interventions in Zanzibar or the socio-cultural factors affecting the delivery, access, and use of research-based interventions to prevent and control malaria. This analysis provides a comprehensive basis for identifying key socio-cultural factors within the context of malaria-interventions.

A limitation of this systematic review is the lack of comprehensively searching through the grey literature (e.g., dissertations, non peer-reviewed studies) concerning cultural barriers hindering malaria interventions in Zanzibar. For instance, ZMCP's policy guidelines and WHO recommendations are widely available online rather than in peer-reviewed studies. By comparing Internet sources and literature together more information can be inferred on what is happening in Zanzibar. However, actually going to Zanzibar and conversing with health officials and the community concerning malaria treatment and cultural barriers would be the most ideal review of the information.

In addition, addressing "grey literature", such as dissertations identified five studies found through search terms (i.e., ProQuest Dissertations & Theses Full Text database). Of the five studies, three did not explicitly focus on the cultural barriers related to malaria interventions (i.e., Cotter, 1986; Stevenson, 2011; VanderKnyff, 2007)

rather they discussed general barriers and barriers to accessing healthcare. Also the studies took place in the Rio Grande Valley in Texas (Cotter, 1986), Ethiopia (Stevenson, 2011), and the Dominican Republic (VanderKnyff, 2007). The other two studies Harvey (2006) and Kiviat (1991) did address specific cultural barriers. For instance, Harvey (2006) described specific cultural factors related to insecticide-treated bed net usage in the Peruvian Amazon. Kiviat (1991) did a global-wide study on all wetland cultures. However, these dissertations are not specifically related to malaria control in Zanzibar.

CHAPTER III

MALARIA IN ZANZIBAR: A KEY INFORMANT STUDY INTO THE DESCRIPTION OF CULTURAL BARRIERS RELATED TO MALARIA PREVENTION AND TREATMENT IN ZANZIBAR

According to the World Health Organization, malaria is a global public health problem with more than one million reported deaths in 2010. The majority of these deaths (660,000) are children (WHO, 2012a). As the continent with the highest burden of malaria, sub-Saharan Africa reports 219 million malaria cases annually, with approximately 2,500 people dying each day (WHO, 2012a). Despite the introduction of malaria prevention and treatment programs sponsored by the World Health Organization, malaria is still a major public health concern in sub-Saharan Africa (WHO, 2012a). Zanzibar, a region in sub-Saharan Africa, has low levels of malaria cases yet still maintains constant surveillance for malaria resurgence (ZMCP, 2010). We direct our attention to this area where malaria seems to be close to elimination in order to examine the role of cultural practices in malaria prevention and control.

Zanzibar as Setting for Study

In Zanzibar there is significant human population movement from the Tanzania mainland to Zanzibar (an archipelago 20 miles east of the mainland). Additionally, the species of mosquito (female Anopheles) that can transmit malaria is still present in Zanzibar. However, the Zanzibar Malaria Control Programme (ZMCP, 2010) malaria early detection system is utilized to detect, confirm, respond to, and confirm a malaria epidemic at the first indication of malaria transmission spikes. The detection system is

the front line for damage control related to malaria epidemics (ZMCP, 2010; McElroy, n.d.). Yet, what the detection system does not do is explain why some people do not seek medical attention right away; or why certain cultural practices related to malaria present health barriers.

Zanzibar and Tanzania Mainland constitute the United Republic of Tanzania, and malaria is considered a leading cause of morbidity and mortality in Tanzania (WHO, 2012a). Malaria cases and mortality from the disease are declining in Zanzibar, throughout Tanzania and all of sub-Saharan Africa (WHO, 2012a). However, Tanzania is reporting that malaria has spread to areas previously unaffected by malaria (Tanzania, Country Report on the Millennium Development Goals 2010, 2011). Specifically, Tanzania has seen a steep decline in malaria-related mortality among children under age-five, falling from 153 (uncertainty interval 148–158) per 1000 in 1990 to 98 (86–116) per 1000 by 2010 (Rajaratnam et al., 2010). None-the-less, Tanzania is not on track to meet the United Nations Millennium Development Goal 4, which calls for an under-age-five mortality rate of 69 per 1000. Zanzibar and Tanzania together contribute to meeting United Nations Millennium Development Goal 4, which means reducing child mortality. In order to ensure the complete eradication of malaria it is vital to understand the contributing factors to the disease and the population migration between mainland Tanzania and Zanzibar.

Socialization and Cultural Practices

Culture is considered to be deeply entrenched in an individual's identity and thought patterns (Parrish & Linder-VanBerschot, 2010). The Center for Advanced

Research on Language Acquisition provides the following definition of culture, which is used in this study: "The shared patterns of behaviors and interactions, cognitive constructs, and affective understanding that are learned through a process of socialization." According to Schaefer (2008), "Socialization is the process whereby people learn the attitudes, values, and actions appropriate to individuals as members of a particular culture" (Schaefer, 2008, p. 58). Thus, socialization plays a significant role in defining culture or cultural practices since cultural values can form from socialization processes (Schaefer, 2008).

Constructs such as cultural barriers are often examined from a qualitative paradigm as illustrated by previous studies that have examined attitudes, beliefs, and perceptions concerning malaria in Zanzibar (Bauch et al., 2013; Beer et al., 2012). Research from other African counties demonstrate how cultural beliefs can influence attitudes about the value of western medicine. Examples include cultural practices such as not bringing babies for immunizations after birth in Ghana and the use of herbal remedies in Kenya to ward off "evil" forces that cause disease (Febir et al., 2013). Similar research has been conducted in Southern India describing culturally-based beliefs about disease etiology that act as barriers to malaria control (Ghosh, Patil, & Tiwari, 2012).

Understanding Cultural Practices about Malaria in Zanzibar

Globally, the depiction of cultural barriers as impacting malaria prevention and control efforts in literature is relatively recent (Febir et al., 2013; Das et al., 2013; Ojakaa et al., 2011), and is non-existent in literature describing malaria interventions in

Zanzibar (Ramji, 2014). Thus, identifying cultural barriers hindering malaria programs might be helpful in devising recommendations for community-based interventions. For that reason, the *why*, *how*, and *what* of cultural barriers in Zanzibar are addressed by this study's three underlying research questions: *Why* do cultural practices become barriers to malaria programs? *How* do cultural practices become barriers to malaria programs? *What* cultural practices become barriers to malaria programs?

In order to answer the research questions, the following tasks were established: (a) identify key individuals who have access to study information (i.e., experts on malaria and cultural practices that might become barriers in Zanzibar); (b) conduct semi-structured interviews with community members about malaria knowledge and information related to cultural barriers in Zanzibar; and (c) analyze participant data to draw themes about the different roles that cultural practices might play.

Methods

Design Overview

Since the research questions called for gathering information about the community, the study design was a key informant approach involving conversing with community and tribal leaders (USAID, 1996; The Access Project, 1999). The advantage of this methodology was the pragmatic gathering of local perspectives from study participants in a strategic way. Due to budget and time constraints, this methodology was selected over other methodologies that required more in-depth investigation (i.e., phenomenological study; van Manen, 1990). The key informant approach was framed in a direct researcher-participant interaction and followed established practices (Rodriguez,

Sana, & Sisk, 2015). Conversations were conducted as semi-structured, brief key informant interviews consisting of nine general questions (see Appendix B). The key informant data in this study provided insight into the *what*, *why* and *how* of cultural practices hindering malaria programs in Zanzibar. The use of Maxwell's research paradigm guided the natural process of this study.

Setting and Data Collection

This study took place in an urban region in west Zanzibar. Participants included urban and rural dwelling individuals. Interviews took place in three distinct locations of interest to government officials--Stone Town, the main city of Zanzibar, and two rural villages (*shihias)*. The data was collected during a two-week span by the author and analyzed in conjunction with a colleague. This study was approved by the Texas A&M University Institutional Review Board and the Zanzibar Ethics Committee.

Only Zanzibar residents were included in this study (e.g., foreigners were excluded). Potential interview participants were purposively identified from among the following categories: (1) local government officials, (2) district/zone medical officers, (3) medical doctors and staff, and (4) residents and community (village) leaders from the selected communities. By looking at these four groups observation of beliefs and perceptions of cultural practices present in Zanzibar could be made across a broad spectrum of key stakeholders in Zanzibar's malaria control efforts.

Participants

This key informant study was involved 75 individuals from four groups identified above. Interviews with individuals from each group provided insight into

views of diverse groups of those working to eliminate malaria, as well as concerned citizens. Community and tribal leaders were considered key informants in category 4 (or group 4) because they typically play a pivotal role within their village to lead the community toward better health, particularly the next generation of young people. In an attempt for broad generalizability, the exclusion criteria were kept to a minimum. For example, a participant had to exhibit behavior or conditions indicating an interview would be difficult or impossible to conduct. In fact, no participant was turned away from wanting to participate. Additionally, given the government's interest in wanting to understand factors affecting malaria prevention and control among its citizens, no foreigners were interviewed.

Measurement

Participants were given a study consent form in English and Swahili and interviews were conducted in either English or Swahili, based on the respondent's preference. The first two study questions focused on respondents' views of malaria as a public health problem in Zanzibar and knowledge of malaria control interventions used in Zanzibar. The next five questions were designed to identify and uncover cultural barriers that hinder malaria programs from the respondents' point of view. The interviewer began by asking direct questions about cultural practices that might hinder individuals from seeking or receiving treatment. Secondary questions probed deeper into how cultural practices might affect seeking malaria treatment and how cultural sensitivity could be integrated into malaria interventions. All study probes were reviewed for face validity. For instance, the study questions were discussed among

colleagues to ensure that they would solicit information for addressing the primary study objectives. The final set of interview probes appear in Appendix B.

Interviews

Interviews were designed to be completed in 30–45 minutes, including time to complete the consent form. As part of the consent process, it was explained to participants that the study data would not be used for any other purposes than understanding factors associated with malaria prevention and control.

The interviews were spaced 15 minutes apart in order to avoid interactions between interviewees. While the initial methodology called for recording respondent conversations, it quickly became clear that this would not be possible due to the reluctance to recorded conversations. Additionally, as each participant provided responses to the interview questions, the researcher prompted the participant to elaborate if answers were short (see Figure 3). The time between interviews allowed the researcher to review observations and write summary field notes concerning each interview.

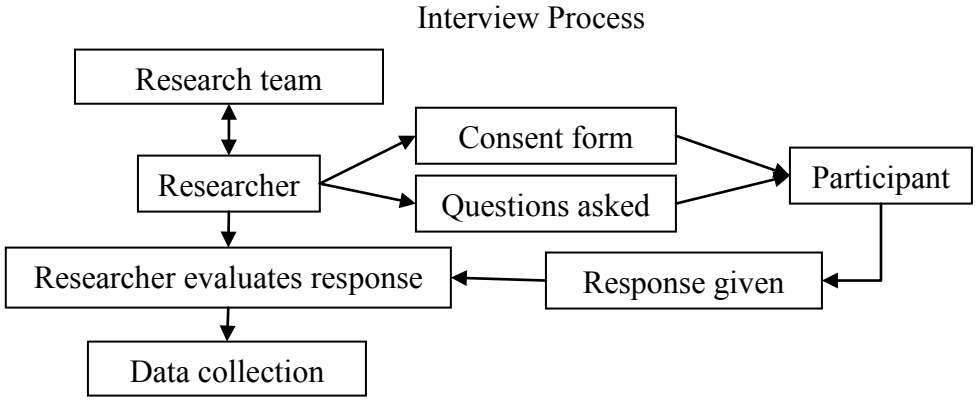

Figure 3. Interview and Data Collection Process

Figure 3 described the research process undertaken for data collection, which was adapted from Maxwell's research paradigm (Maxwell, 2005). The researcher explained the purpose of the study and allowed the participant to ask any questions concerning the study. If the participant agreed to participate in the study, then the researcher asked the participant to sign a consent form. Next, the researcher proceeded to ask the participant the interview questions. During the interview process if the researcher felt the participant was not descriptive enough when answering a particular interview question, the researcher probed further.

Data Analysis

Interview field notes (in English and Swahili) were examined by two researchers using content analysis, a commonly used method for systematically making inferences from narrative text (Hsieh & Shannon, 2005). The analysis included the identification of broad themes. The themes included both common and diverse participant perspectives. The data were discussed and agreement among researchers was based on consensus of identified themes presented in the data. Next, the researcher sought to understand the *why* and *how* cultural practices hinder malaria programs from the collected data.

The researchers then evaluated the qualitatively captured themes. Quantitatively speaking, cultural barriers do not have an ordering system, nor is one cultural barrier more measurable than another. Therefore, cultural barriers were treated as categorical or nominal (Thompson, 2006). Since emergent themes and cultural barriers are nominal (or categorical), the researcher recorded and counted the number of times cultural barriers

were mentioned by interviewees. The frequency with which cultural barriers were mentioned by interviewees was examined by the researchers.

Results

The sample consisted of 75 individuals with an average age of 35, representative of a diverse population with varying characteristics (see Table 2). There were four groups characterized as health officials, district/zone health officers, medical doctors and staff, and community. The community consisted of individuals from Stone Town and two villages outside of Stone Town representing a diverse population for uncovering information about the cultural barriers that hinder malaria programs (i.e., the setting and participants are appropriate for this study (Marshall & Rossman, 2010).

Table 2

Key Informant Group Sample Characteristics on Cultural Barriers

Sample type	Sample	Male/ Female	Mean age	Education/ SES	Location
Health officials	7	4/3	41	high	urban
District/zone health officers	6	3/3	48	high	urban
Medical doctors and staff	5	2/3	35	high	urban
Community-Stone Town	15	8/7	32	medium	urban
Community-Village 1	21	11/10	26	low	rural
Community-Village 2	21	11/10	35	low	rural
Total	75	39/36	35	18/15/42	33/42

Note. High means bachelor degrees and higher obtained; medium is some bachelor degrees obtained; low means most people have not obtained a bachelor degree. 18/15/42 means 18 of the sample is of high education, 15 is of medium education and 42 is of low education. 33/42 means 33 of the sample represent an urban population, while 42 represent a rural population. SES means social economic status, and the SES level was related to education; in that, individuals with educational degrees were considered to have high SES in this study. Medium SES was a mixture of both individuals with educational degrees and without.

Interview questions (Q1-Q9 in Table 3) were specifically constructed to probe into particular aspects of participant responses. The first column identified the general theme, while the second column provided specific examples elaborating on each theme. The initial questions were designed as warm-up questions to get the respondent to think about malaria and malaria control in Zanzibar. Interview questions Q1 and Q2 were designed to solicit feedback participants' general knowledge concerning the status of and currently available interventions for malaria. In response to Q1, nearly all participants were aware that malaria had declined in Zanzibar (98%). Most participants identified long-lasting insecticidal treated nets s as the predominant prevention strategy in response to Q2. However, concern was voiced by rural respondents that there was unequal distribution in the villages.

Additional questions probing whether or not cultural practices hindered individuals from receiving malaria treatment resulted in more varied response. While most respondents reported (Q3) that cultural practices were not a hindrance, 30% (n = 22) of the participants believed cultural practices did hinder malaria treatment. Continued conversation with participants concerning the role of cultural practices in seeking malaria treatment increased the relevance of cultural barriers in malaria treatment (i.e., 47% reported traditional medicine/healers and the devil's presence as a hinder to malaria treatments/prevention).

Table 3

Synthesized Data from Key Informant Interviews: The What, Why, and How of Cultural Barriers

Q#	Emergent themes	Further description
Q1	Nearly everyone thought malaria had declined (98%; *n* = 73)	While, two participants (2%) thought malaria was increasing
Q2	Participants almost all mentioned LLINs as a common prevention method for malaria (50%; *n* = 38). There was also concern about unequal or no distribution of nets in the villages (*n* = 4).	Prevention methods commonly described by participants were: *LLINS, IRS, ACT or medicine, health education, cleaning the environment, case management, surveillance & detection, and RDTs
Q3	Most of the total sample said cultural practices do not hinder malaria treatment (60%; *n* = 45). Another 10% (*n* = 8) were undecided	While, 30% (*n* = 22) of the total sample said cultural practices do hinder malaria treatment
Q4	About half of the participants did not believe that cultural practices would keep people from seeking malaria treatment (52%; *n* = 39). Less than 1% (*n* = 1) undecided	While, the other 47% (*n* = 35) reported traditional medicine/healers and the devil's presence as a hindrance to malaria treatments/prevention
Q5	Generally, participants agreed that interventions could be culturally sensitive[1] (85%; *n* = 64)	While, 11 (15%) participants thought culture should be separated from malaria interventions
Q6	Most participants thought integrating culture with malaria interventions was a good idea (70%; *n* = 53).	While, 11 (15%) participants said culture and malaria interventions do not mix; leaving another 11 participants undecided.
Q7	Participants reported the use of traditional healers, traditional medicine use, delay to go to the hospital, disbelief in treatment, and behavior counter-intuitive to malaria prevention or treatment as cultural issues that would discourage malaria treatment (35%; *n* = 24).	Also, traditional healers are said to still retain some level of influence over the people and is considered the greatest barrier to treatment.

Table 3 Continued

Q#	Emergent themes	Further description
Q8	Nearly everyone said the community would accept malaria treatment if cultural sensitivity was introduced in future interventions (95%; *n* = 71) with the condition of training or education incorporated with new interventions.	While, the other four participants expressed they had no idea what the community would accept (*n* = 1), that the community would refuse to cooperate with taboos** (*n* = 1), and that the community would say no because of medicine use and the side-effects (*n* = 2).
Q9	Most participants understood malaria symptoms and sought medical attention within 24 hours (68%; *n* = 51).	The range of time to seek medical attention was from 24 hours to 7 days (average delay = 2 days).

Note. Q# refers to interview question number; LLINS = Long lasting insect treated nets; IRS = Indoor residual spraying; ACT = Artemisinin combination therapy; RDTs = Rapid diagnostic testing
* = written in order of most described by participants; **taboos were described from the participant as cultural practices that should not be mixed with malaria prevention and treatment.
[1] = by cultural sensitivity this study refers to the level of awareness an intervention may have considered cultural barriers when planning, implementing, and conducting an intervention.

Participants were in general agreement that malaria interventions should have a cultural component. For example, 85% of participants thought interventions could be culturally sensitive (Q5) and 70% thought integrating culture with malaria interventions was a good idea (Q6). In this study, cultural sensitivity refers to the level of planning, implementing, and conducting of an intervention which considered cultural barriers throughout the process. In this vein, the many participants (35%) could name specific cultural barriers hindering malaria treatment (Q7) and most (95%) also believed addressing culturally sensitivities (e.g., folk beliefs about disease etiology) in future malaria interventions would be acceptable (Q8).

In regard to personal practices in seeking immediate action to possible malaria illness (Q9), most participants (68%) understood malaria symptoms and sought medical

attention within 24 hours in urban areas. However, in one rural village a small minority (20%) waited two to three days before taking action. While, another smaller minority (12%) in another village thought it best to wait four to seven days before seeking medical help.

Highlights of Participant Observations

What emerged after general probing was a general recognition by nearly half of the respondents of cultural barriers to malaria treatment based on traditional beliefs about medicine and healers (Table 3, Q7). Many participants, especially those in the urban areas, described a desire to educate the population that still relied on traditional medicine and healers. One participant described a traditional medicinal practice, "They take the leaves of the mtunda tree and burn them over a fire while standing over the fire with a blanket or cover allowing the smoke to collect so they can breathe in the fumes" (related to Q4 and Q7). The traditional healers still have influence over people, according to another participant.

Interviews with health officials revealed substantial efforts to educate and train the community and its leaders about malaria. Yet, based on participant interviews there seems to be a continued resistance to modern medicine or at least a duality in medical perspectives. Participants noted, "People go to the traditional healer first, then the hospital if their condition gets worse." These cultural beliefs, associated with a delay or hindrance of malaria treatment, were reported more by rural participants.

According to one key informant, citizens from Zanzibar can recall common beliefs that malaria came from the devil and the only way to get rid of malaria symptoms

was to drive the devil away. Malaria symptoms have been associated with the devil's presence and individuals would take certain cultural actions to get rid of the devil. Also, according to Zanzibari key informants, the belief was centered on the notion that if the devil were pushed away, then sickness would leave the body. In response to the belief of the devil's presence, individuals would seek their traditional healer for advice and possible medicinal aid or individuals would self-medicate. However, culture is considered to be deeply entrenched in an individual's identity and thought patterns (Parrish, Linder-VanBerschot, 2010). For that reason, constant and long-term reaffirmation and correction related beliefs and understanding of malaria is necessary.

Another participant indicated one to two percent of the population believe in traditional healers. There is a continued belief in the devil's presence among a small proportion of the population. According to one participant, "If a household thinks they're getting malaria, then they think maybe the devil is in here, and proceed to take people to the toilet to somehow flush the devil out of their home." However, such perceptions of malaria do not have to be dramatic, since one participant said, "Some people just don't want to waste time going to a hospital, so they go to the traditional healer first." Also, interestingly, several participants described cleaning the environment as necessary to stop the spread of malaria.

Alternatively, one participant expressed, "You got to convince some people to change their habit of going to the traditional healer first and if their symptoms get worse then they'll go to the hospital."

Yet, another participant said, “Some people go to the hospital because they think they have malaria, but when the laboratory says they don’t; they get upset and say they feel malaria in the body and say the laboratory is wrong.”

These two different positions illustrate two extremes in culturally based understanding and beliefs. On one hand, an individual seeks a local traditional healer or elf medicates when concerned about malaria. On the other hand, an individual gets upset if no one believes malaria is present in that individual, and medical tests that don’t confirm if malaria is present only adds to sentiments expressed by one participant, “Some people refuse to go to the hospital because they don’t believe or trust the doctors.”

In summary, a found theme in this study was the reported use of traditional healers and herbal medicine or self-medication, which participants associate as a lack of education and distrust of laboratory results.

Summary of Research Questions

Why are there cultural barriers in Zanzibar (RQ1)? Our interviews confirm that cultural beliefs and barriers are transmitted through a process of socialization through which older people pass their knowledge and beliefs along to their children. Consider what a health official participant said concerning malaria in the past, “Twenty years ago there were a lot of misconceptions and misunderstandings about malaria”. At that time people did what they could to understand what kept them safe from malaria and were highly susceptible to accepting cultural practices endorsed by respected community members.

Additionally, the health official added, “The spread of traditional healers and medicine was more prevalent then and educating the community about using mosquito nets and allowing indoor insecticide spraying was more difficult.”

The desired behavior toward malaria prevention and treatment expressed by the medical community is only beginning to take root regionally, according to health officials who participated in this study.

How do cultural practices serve as barriers to malaria treatment (RQ2)? Our interviews revealed that the use of traditional healers and herbal medicines can serve as a barrier to malaria prevention and control. The continuation of traditional cultural practices can be illustrated by one participant who said, “Some people just develop old habits like going to the traditional healer first. They don’t think about it, they just do it.”

What the participant expressed is that these “old habits” were formed long ago and continue to inform people about what to do. The habit could be cultural in the sense that it is what everyone has done in the past and continues to do now (i.e., socialization). In this case, the *how* is related to individuals not changing or accepting modern solutions for malaria treatment and prevention, but preferring traditional beliefs and practices that are counter to modern medicine and public health practices.

What cultural practices are barriers in Zanzibar (RQ3)? Traditional healers and the use of herbal medicines emerged in the interviews as the number one barrier. Still others, though a very small percentage (<1%) claimed out-right refusal of modern medicine and medical attention. There was no rationale to explain this behavior, yet interviewees described politics and mistrust as sources to refuse all medical attention.

Most participants point to education as the solution to dissolving associated behaviors. One health official viewed the use of traditional healers as the lack of education and claimed, “Educational barriers are best solved by constant and open conversation about malaria.” The goal, according to the health official, is to dismiss and clear up misconceptions.

Discussion

One interesting discovery was a discrepancy in reporting over the course of the individual key informant interviews. As an example, over the course of the interview, participants began to describe cultural barriers after claiming there were no cultural barriers. This kind of response was found in our current study when considering interview questions with similar probing objectives, specifically Questions 4 and 7, “What cultural practices would keep people from seeking malaria treatment?” and “What culture issues would discourage individuals from seeking malaria treatment?” Further indication of this behavior is illustrated from Q3 to Q7 probing. Responding to Q3 participants said cultural practices do not hinder malaria treatment (60%; $n = 45$), yet by Q7 there is an observable change in how participants began to answer. By Q7, participants described cultural practices they know occur in their communities, yet do not acknowledge they themselves participate in such practices.

Although participants said there are not cultural practice barriers, they recognize the cultural practices of others in the community who fit the study questions being asked. This phenomenon reflects that questions asked in different ways may elicit different responses (Neal, 2013) that respondents will be more forthcoming after they are more

familiar with the interviewer (Gill et al., 2008), or that participants can hold conflicting perspectives regarding disease and illness etiologies (Putsch & Joyce, 1990). What this indicates a need for caution in interpreting data and drawing conclusions from data derived by different methodological approaches in any one study (Creswell, 2009; Caracelli & Greene, 1993).

The dissemination of malaria information varies by region, especially in urban versus rural settings. The malaria information differences were observed when participants responded to Q1, Q2, and Q9. Information about malaria prevention was observed to be lacking among young people in rural villages. Meaning vital information about malaria prevention was seldom seen among villagers. Malaria treatment understanding was comparable, except related to response time to malaria symptoms. Rural individuals said they would wait a week compared to 24 hours from the urban individuals. In the urban areas, people were more likely to know and understand malaria and tend to take care of malaria-like symptoms right away. Generally urban participants described scientific evidence as the rationale for having their current knowledge of malaria.

If we are to identify cultural barriers to malaria, then we start with what we can draw from culture exhibited during the interviews. Listening and observing how participants talked about their culture we learned that despite religious differences, social economic status, and educational level information dissemination of best practices about malaria prevention and control traveled quickly in the urban regions. Traditional beliefs

which often act as deterrents to appropriate malaria control are harder to change in rural areas among less educated villagers.

Conclusion

In summary, semi-structured dialogue with health officers, health officials, medical doctors and staff, and finally with the community leaders and members provided a descriptive account of the key stakeholders' perspectives of malaria in Zanzibar. This key informative approach helped uncover the specific cultural practices still present in Zanzibar. The research questions provided insights into the *why*, *how*, and *what* cultural practices influence current malaria programs in Zanzibar. In this study, the use of traditional healers and medicine emerged as a major factor hindering malaria treatment in Zanzibar. Health officials reported that the community needs more education about malaria and this is evident from interviewees from the villages.

Implications

Implications from this study validate the effort made by the Zanzibar Malaria Control Program (ZMCP) to correct misunderstandings and misconceptions about malaria in the community. Known to ZMCP is the need to educate individuals about malaria, especially in rural areas to counter the behaviors of people seeking traditional healers or witch doctors. What was not known is ZMCP's impact on educating the community. From this study, the Zanzibar government can observe the diminished condition of malaria (below 1%) and attribute current ZMCP interventions to breaking down barriers to health care, especially in urban areas. A major concern for future research is to ensure the next generation is aware of malaria, because participants 20

years and younger seem less knowledgeable about the causes of, and appropriate treatments of malaria, especially in rural areas.

Limitations and Research Tradeoffs

Several limitations can be noted. This study reflects responses from a relatively small number of individuals in targeted regions in Zanzibar, hence limiting research generalizability. Additionally, responses were limited to Zanzibar citizens, so the influence of foreigners in malaria prevention and control efforts are unknown. The research method chosen, single informant interviews, does not permit the richness of data that an in-depth qualitative study might. The requirement that interviews not be recorded hindered a comprehensive content analysis of interviews utilizing computerized software.

Throughout the study the interviewers attempted to maintain the same level of interaction with all interviewees. This involved maintaining the same verbal style and tone, eye contact, body language, and attention to limit potential bias responses from the interviewee, due to differences in how the interviewer asks the questions. Although not a limitation but rather a design issue was the initial design for interviews to take 30–45 minutes; over the course of the interviewing period, the process began to take less time (with the themes not needing to be probed in as much depth due to saturation of responses) and ranged from 10–15 minutes.

Limitations to interview studies might be improved by having scripts available to the interviewer. In designing the study, there was a concern that using a script could impact authenticity or the feeling of two people talking naturally. As a result, script

construction was abandoned in favor of collecting data through natural conversations between two people concerned about health issue in Zanzibar (i.e., malaria and cultural barriers/practices).

Finally there is variation on how much time and emersion is really needed to gather information from an interview (Gill et al., 2008), or in this study information related to cultural values and beliefs. All research methodologies have advantages and disadvantages and given time and resources, brief key informant interviews were seen as appropriate for getting a quick snapshot of different key stakeholder perspectives about the extent and nature of cultural barriers related to malaria prevention and control in Zanzibar.

CHAPTER IV

POLICY REFLECTION IN ZANZIBAR: A STUDY INTO ENHANCING EXISTING MALARIA INTERVENTIONS IN ZANZIBAR

Governmental entities have taken on a wide array of roles linked to the provision of certain safeguards for ensuring health and welfare of their citizens. Although malaria is a world-wide health problem noted for some time (Cleaver, 1977), there is often insufficient prevention and treatment within developing countries to reduce the risks of malaria (WHO, 2012a). Fortunately, international health organizations (such as the United Nations) are devoting resources to help with the global eradication of malaria (e.g., WHO, 2012a) as are NGOs (Non-Government Organizations), both internal and external to specific developing countries.

Additionally, increased financial aid from foreign investors has contributed to the abatement of malaria's death toll. As an example, the Gates Foundation has committed nearly $2 billion toward malaria grants. Results of such investments illustrate malaria scale-up interventions during the last decade averted an estimated 1.1 million malaria-related deaths (WHO, 2012a). Scale-up interventions have contributed to malaria's declining status in sub-Saharan Africa by implementing a wide array of research-based interventions that target prevention and treatment. These interventions include long lasting insecticide treated nets (LLIN's) and indoor residual spraying (IRS) as malaria prevention. Treatments include artemisinin combination therapy (ACT) and sulphadoxine-pyrimethamine.

Another dimension linked to declining malaria cases is the fact that researchers are beginning to understand the behavioral, social, economic, and political factors that hinder malaria control and elimination (Mwenesi, 2005). Mwenesi (2005) describes several current knowledge gaps and threats to the continued success of malaria eradication including: 1) the need for individual behavior change; 2) a lack of concordance between biomedical and explanatory models of disease; 3) the synthesis of gender-sensitive interventions; 4) the failure of meaningful community participation; and 5) the influence of poverty, human mobility, conflict, and displacement. Although there are marked advances in communication capabilities, challenges in altering key behaviors critical in the successful adoption of malaria prevention strategies in this region remain. And behavioral change is a long-term process influenced heavily by the cultural beliefs and perceptions of individuals and their communities (Mwenesi, 2005).

Despite an increased understanding of the behavioral, social, economic, and political factors that hinder successful implementation of malaria programs (Mwenesi, 2005), little is known about the nature or extent of cultural barriers in specific countries. This study sought to better document cultural barriers that hinder successful implementation of malaria interventions by using Zanzibar as a case study, with an eye toward policy recommendations to directly address these cultural barriers. By identifying prevalent attitudes and beliefs emerging from participant interviews, this study seeks to contribute to solutions leading to malaria's eradication. The information gathered from interviews can serve contributed to evidence about cultural practices as barriers to malaria prevention, diagnosis, and treatment. Our policy review involves three steps: 1)

the documentation of the international investment in Malaria control; 2) the exploration of how cultural beliefs and practices may constrain the effectiveness of interventions; and 3) recommendations for altering programs and policies supporting malaria treatment and prevention in Zanzibar.

Over the last ten years, WHO's global efforts to eradicate malaria have been associated with significant declines in malaria cases and deaths (WHO, 2012a). However, further study is needed to understand why African countries have languished behind other developing countries' in malaria treatment and prevention strategies. One avenue of exploration is investigating the influence of culture. Exploration of regional (e.g., Zanzibar) cultural practices can play a vital role in addressing specific community needs and offers the potential global impact of needs assessments on malaria conducted throughout endemic regions (i.e., sub-Saharan Africa). As a result, this study seeks to address the following questions:

1. What international policies and programs currently exist that can help eradicate malaria in sub-Saharan Africa? (RQ1)
2. What cultural practices could hinder malaria treatment and prevention in Zanzibar (RQ2)?
3. Taking Zanzibar's most effective malaria initiative, the Presidential Malaria Initiative, how might the initiative be adapted to take cultural barriers into account (RQ3)?

While global policy involves the use of all and or a combination of indoor residual spraying , long-lasting insecticide treated nets, artemisinin-based combination

therapy, sulphadoxine-pyrimethamine), rapid diagnostic testing, and adoption of surveillance systems, the challenge is introducing and integrating cultural strategies for these interventions in order to diminish barriers.

The WHO Response

In the past 10 years, WHO has solidified its understanding of malaria prevention and control with a literature database of 160 publications (2003-13). Table 1 provides an overview of how the WHO's general policy framework, which has shifted over the years. The current *Test. Treat. Track.* initiative to target malaria was announced on World Malaria Day 2012 (WHO, 2012b). The initiative includes a scale up framework to strengthen the three fundamental pillars to malaria control and elimination--diagnostic testing, treatment, and surveillance (WHO, n.d.a, 2010, 2011b, 2012c).

Policies and Programs

The WHO database for the last ten years reflects tested research targeting four main areas of focus: vector control, treatment, surveillance, and diagnoses. From the four main areas of focus, policy and programs have emerged to strengthen the overall malaria elimination effort. Table 4 provides a synopsis of WHO's policy focus and framework development. Following the visible global push on malaria from WHO, other organizations contributed to the cause. In 2012, the Canadian International Development Agency awarded WHO's Global Malaria Programme $2 million annually to fund successful proposals to empower integrated community case management of malaria (pneumonia and diarrhea were also included), which is known as the Rapid Access Expansion 2015 Programme (RAcE 2015). The RAcE 2015 is said to impact about one

thousand villages in Democratic Republic of the Congo, Malawi, Mozambique, Niger, and Nigeria (five malaria-endemic countries). The estimate of population care per country is believed to be one million people with 150,000 of them children under age five.

An extensive review of policy-setting for malaria control and elimination by the Global Malaria Programme led to the 2011 establishment of the Malaria Policy Advisory Committee (MPAC), charged with providing advice to WHO on policy recommendations to control and eliminate malaria (D'Souza & Newman, 2012; MPAC, 2012a, 2012b, 2013). As a result, major policy reforms now come from MPAC. There are older programs that reinforce current policy and contribute to MPAC's efforts, such as the Roll Back Malaria initiative to reduce the global malaria burden (WHO, 2005). This project provided universal access to diagnostic testing (WHO, 2011b), and contributed to the current *Test. Treat. Track*. program.

Table 4

Historical Summary of WHO Frameworks and Policies for the Last 10 Years

Year	Framework	General Policy
2003	*	Access to antimalarial medicine, LLINs, ACT
2004	(1) Malaria prevention and control during pregnancy in the African region (2) Global integrated vector management	Scale up of RDTs, Pregnancy, DDT, early detection, prevention, and control
2005	Coordinated national action scaling up insecticide-treated netting program in Africa	LLINs, Roll Back Malaria, Malaria and HIV/AIDS interaction
2006	Integrated delivery of Insecticide-treated nets and immunization	IRS, ACT, Iron supplements, Vector control, RDTs
2007	Integration	LLINs, pregnancy
2008	Integration	Global malaria control and elimination, integrated vector management
2009	Integration	Case management, ACT, RDTs, IPTi
2010	Integration	Microscopy, SP, ACT, Global Malaria Programme
2011	Integration	LLINs, ACT, RDTs, SP-IPTi
2012	T3: Test. Treat. Track–Scale up framework for diagnostic testing, treatment, and surveillance	IPTp-SP, ACT, RDTs, Global plan for insecticide resistance management, MPAC, malaria elimination, surveillance
2013	T3 is WHO's current framework	ACT, IRS, IPTp-SP, management of sever malaria, insecticide resistance monitoring

Source. WHO database.

* = no framework described in 2003, but possible 2002 framework believed to still be in effect, which is scaling-up insecticide-treated netting programs in Africa.

Integration = No framework is present, but the focus is in using integration methods. Integration is the combining of several interventions.

DDT = dichloro-diphenyl-trichoroethane (insecticide); LLINs = Long-Lasting Insecticidal Nets; RDTs = Rapid Diagnoses Testing; IRS = Indoor Residual Spraying; ACT = Artemisinin-based Combination Therapy; IPTi = Intermittent Preventive Treatment in infants; IPTp = Intermittent Preventive Treatment of malaria in pregnancy; SP = sulfadoxine-pyrimethamine; MPAC = Malaria Policy Advisory Committee.

Successes

As efforts for malaria elimination the WHO focused on community case management, diagnostic testing, drug resistance and containment, high-risk groups, malaria elimination, malaria vaccine development, preventive therapies, surveillance, treatment, vector control, and insecticide resistance (WHO, n.d.b). For example, the WHO response to community case management has been the establishment of prompt diagnostic testing and proper treatment of malaria among children under age five in the community and at home. Community case management has evolved into integrated community case management, which integrates expanded strategies to address malaria (WHO & UNICEF, 2012). In other words, each evidence-based malaria strategy continues to evolve from further research and discovery in the field. As a result, much of WHO's success is centered around the effectiveness and impact of malaria strategies in different settings. Specifically, drug treatments, vector control, surveillance, and educational materials for teaching countries to eliminate and control malaria.

Major Barriers

Several major barriers continue to pose a challenge to the control and elimination of malaria. The MPAC (2013) described surveillance as weakest where malaria burden is greatest and has reported that in only 58 countries (15% of the global malaria burden) is it possible to assess malaria trends. Drug resistance is also a major problem and results in constant monitoring of any emerging resistance to artemisinin combination (MPAC, 2013). Another major barrier is linked to non-malaria febrile illness, which also expends anti-malarial drugs, adding strain to supply pools for those with active malaria cases

(MPAC, 2013). The MPAC (2013) has also expressed urgency to provide guidance to countries about vector control, especially at the community level. Further, funding remains limited, which exacerbates the problems presented by all major barriers (MPAC, 2013).

Major Stakeholders

There are several other major players in the push to eliminate and control malaria. Organizations such as the United Nations Secretary General's Every Woman Every Child Initiative, United Nations Children's Fund (UNICEF), the President's Malaria Initiative, Save the Children, and USAID have greatly expanded the resource base for malaria initiatives. These stakeholders are working collaboratively and all rally to MPAC's recommendations and policies. This recently established unified front has created a more powerful team approach targeting malaria eradication.

The United Nations (UN) leads the global conversation on health issues and makes a point to identify countries in need. One method to motivate a greater response to these critical health issues around the world is for the UN to construct and set global standards in the form of the Millennium Development Goals (MDG). There are several MDG indicators to measure a country's status in reaching global health goals, including MDG 6, which pertains to malaria.

In addition to the UN major international companies, or their philanthropic arms such as the Gates Foundation, play a vital role in global health and disease prevention issues. As an example, the Gates Foundation has expressed a commitment to malaria eradication and identified highly effective integrated interventions (Roberts & Enserink,

2007). Yet there is uncertainty about where and how best to utilize these types of interventions. Innovation becomes essential to expand the understanding of where and how to integrate interventions that will result in progress toward malaria control and eradication. Sustained research and development is needed to create a diverse array of tools, avoiding over-reliance on a small set of anti-malaria interventions, as such over-reliance is risky because of malaria's adaptability. The world needs more effective policies and increased funding to secure lasting gains against this continuing global health threat.

Understanding Culture Influences in Zanzibar

The WHO's efforts in the last 10 years have provided significant guidance on effective malaria interventions and policies. Given this backdrop to the international response to cultural practices and their relationship to malaria interventions, a better understanding of the nature and extent of cultural practices regarding malaria prevention and treatment can greatly extend foundational practices established by WHO. To address this research gap, we have conducted a key informant study to examine influences on malaria eradication efforts in one Zanzibar, Tanzania.

Interviewing Key Stakeholders

Following van Manen's (1990) approach, semi-structured, interviews consisting of seven questions (included in Table 2 in both English and Swahili) were conducted. The purpose was to identify and describe cultural barriers that hinder malaria interventions. Data from the interviews were evaluated and the numbers of cultural barriers were recorded (frequency count of cultural practices). Generally, by observing

the patterns in the interview data this study identified *what* cultural practices are present and *how* consistently they are cited across interviewees and interviewee clusters. The goal of evaluating the data was to provide useful information for policymakers in eradicating malaria in Zanzibar. Data was collected during a two-week span in August 2013. The Texas A&M University Institutional Review Board and Zanzibar Ethics Committee approved this study and its protocol.

Location and Context

The sample was taken from the west region of Zanzibar, providing a mix of urban and rural population. Zanzibar is part of sub-Saharan Africa, where 90% of all malaria deaths occur (WHO, 2012a). In Zanzibar there is constant human movement from the mainland (Tanzania) to Zanzibar (an archipelago 20 miles off the mainland). Also, the species of mosquito (female Anopheles) that transmits malaria is present in Zanzibar.

More specific to this study, five groups were interviewed in the key informant approach in efforts to get input on the various groups' expertise, knowledge, and perspective related to barriers to malaria prevention, diagnosis and treatment. These groups included: (1) Individuals from the Zanzibar Malaria Control Programme, (2) representatives from district and zone health offices, (3) local community clinic medical staff, (4) representatives from two rural villages, and (5) residents of the urban community of Stone Town.

Participants

The sampling strategy targeted four key informant groups: (1) local government officials, (2) district/zone health officers, (3) medical doctors and staff, and (4) participants from the community (Stone Town, and two villages or *shihias*). A total of 75 interviews were conducted across the four groups. Since tribal leaders typically play a pivotal role within their village, they were also interviewed and clustered with those in group four. Group one consisted of individuals from Zanzibar Malaria Control Programme, group two involved interviews with the district and zone health personnel, group three involved participants were health clinic physicians, and group 4 encompassed of three sub-groups representative of Stone Town and two rural villages. Interviews were conducted at six different sites. The four groups are believed to represent a distribution of the population knowledgeable about cultural practices in Zanzibar and barriers to malaria interventions. There were no participants who refused to participate in this study.

Procedure/Interview

Participants were given a study consent form in English and Swahili, but asked to sign the English version. If they agreed to consent, participants answered seven interview questions (Appendix C). The five questions were designed to inform the researchers of cultural barriers that hinder malaria programs from the interviewee's point of view. These questions also tapped participants' knowledge concerning community acceptance of culture-infused interventions and what participants understood as symptoms of malaria.

The interview process was developed with a 30-45 response time, although the actual length was shortened after data saturation of key themes was observed. Information from interviews was discussed among the raters in order to reach consensus of emerging themes. The interview process was initiated by visiting purposefully selected urban and rural sites and asking for volunteers. Volunteers were identified by their willingness to participant under the conditions of the consent form and study inclusion factors. The interviews took place in participants' homes, in the living room or main room.

Data collected from the interviewees consisted of field notes. After the consent form requirements, the interviewer proceeded with questions organized in the Interview Guide (Appendix C). The researchers asked for elaboration if a participant's response did not go beyond a yes or no response; this was done to better understand the complexities behind respondent perspectives and what the respondent understood concerning malaria and cultural barriers.

Data Analysis

All field notes were evaluated for common cultural patterns emerging from socialization, as in shared patterns of beliefs in each stakeholder group. Cultural barriers do not have an ordering system nor is one cultural barrier measurably more significant than another (i.e., cultural practices cannot be measured with a ruler). As a result, cultural barriers are treated as categorical or nominal (Thompson, 2006). The researcher recorded the identification and number of times participants described the presence of a cultural barrier during all 75 interviews. The data was analyzed with the use of Microsoft

Office Excel 2007. The number of emerging cultural barriers demonstrates what cultural barriers are present and the frequency with which they were mentioned.

Results

The average age of interviewees was 35. Characteristics of the groups are detailed in Table 5. The sample distribution in Table 5 was carefully selected in such a way to allow more interviews with community members (stakeholder group four).

Table 5

Descriptive Information of the Sample

Sample type	Sample	Gender male/female	Mean age	Education high/medium/low	Location urban/rural
Health officials	7	4/3	41	high	urban
Zone health officers	6	3/3	48	high	urban
Medical personnel	5	2/3	35	high	urban
Stone Town	15	8/7	32	medium	urban
Village 1	21	11/10	26	low	rural
Village 2	21	11/10	35	low	rural
Total	75	39/36	35	18/15/42	33/42

Note. High means bachelor degrees and higher obtained; medium is some bachelor degrees obtained; low means most people have not obtained a bachelor degree. 18/15/42 means 18 of the sample is of high education, 15 is of medium education and 42 is of low education. 33/42 means 33 of the sample represent an urban population, while 42 represent a rural population.

Potential cultural barriers were identified by participant responses during interview questions related to research topics 1 through 5, as illustrated in Table 6. For instance, by counting the number of barriers that hindered malaria treatment described by participants for Q1 (Table 6), six distinct responses emerged with natural drugs/herbal medicine/traditional medicine identified as the most prevalent cultural

barrier hindering malaria treatment. For Q2, 10 barriers were described from participants with natural drugs/herbal medicine/traditional medicine again being listed as the predominant practice keeping people from seeking treatment (n = 13) and traditional healers or witch doctors as the second most common cultural practice (n = 8).

Table 6

Synthesized Interview Data

Research Probes (Q)*	Barrier (Frequency)
Q1: What specific cultural practices hinder malaria treatment	Natural drugs/herbal medicine/traditional medicine (8) Disbelief or distrust (4) Devil thinking or religious belief (3) Hygiene/environment (3) Traditional healers or witch doctors (3) Need behavior change/education (1)
Q2: What cultural practices would keep people from seeking treatment	Natural drugs/herbal medicine/traditional medicine (13) Traditional healers or witch doctors (8) Devil/spirit thinking or religious belief (5) Poor educational belief (3) Proximity/discomfort to seek healthcare (2) Refusal to malaria treatment (2) Preference of single dose drug rather than combination, like ACT(1) Disbelief or distrust (1) Environmental control (1) or Political reasons (1) Training/education (1)
Q3: How can current interventions be more culturally sensitive	Yes, by addressing the following: Health education/teach (3) on chemicals from IRS and proper LLIN use Informing people who reject IRS (2) Misuse of nets or LLIN(1) Seeking traditional healers (1) Having the appropriate behavior toward malaria (1) Reducing political agendas related to malaria treatment (1) Refusal to use LLINs (1) Making environmental changes to discourage vector breeding (1)

Table 6 Continued

Research Probes (Q)*	Barrier (Frequency)
Q4: What is your opinion about integrating culture and malaria intervention	My opinion is that: Health education/Correct belief needed (12)–especially in rural areas Follow what government mandates to do (7) Communication among people needed (5) Build more health centers/no access to health workers (2) Better environment control (2) Destroying larva sites (2) Hoping for adequate dispersion of resources (2)
Q5: What culture issues would discourage individuals	Poor constructed knowledge about malaria is a barrier/needed (8) Traditional healer (6) Traditional medicine/herbal medicine (6) Behavior change needed (6) Delay to go to the hospital (5) Refusal of modern medicine/rely on old methods of healing (4) Religious belief/devil thinking (3) Environmental control (3) Disbelief and distrust (3) Superstition/witch doctors (2) Improper use of medicine (2) Political reasons (1)

Note. LLINS = Long lasting insect treated nets; IRS = Indoor residual spraying; ACT = Artemisinin combination therapy; RDTs = Rapid diagnostic testing

While earlier data showed that the majority (85%) of respondents believed that current interventions could be made culturally sensitive, very few respondents articulated ways in which this might be accomplished (Q3). There were only 11 specific responses with educational strategies being the most common suggested strategy (n = 5). However, the probe about integrating culture and malaria interventions (Q4) solicited more specific responses (n = 32) with health education and additional communication between people emerging as the most common opinions for achieving this goal (n = 5). Several respondents emphasized the importance of following government mandates (n =

7). Finally, there were substantial responses (*n* = almost 50 responses) to the last probe (Q5) regarding how cultural issues could discourage individuals from seeking malaria treatment. Traditional healers/medicine emerged as a major deterrent to seeking malaria treatment (*n* = over 20). Poor education about malaria was also reported a major barrier (*n* = 8).

Interesting subgroup characteristics are revealed when examining variations by geographic region (see Figure 4). For example, the two rural communities noted high rates of malaria as the norm whereas everyone else responded with much lower projections of rates. The rural participants did not have as much knowledge concerning malaria prevention and treatment as compared to urban participants, and were more likely to hold traditional believes about the causes of, and treatments for, malaria. This suggests that different strategies are necessary for sustained malaria control and prevention in rural versus urban areas.

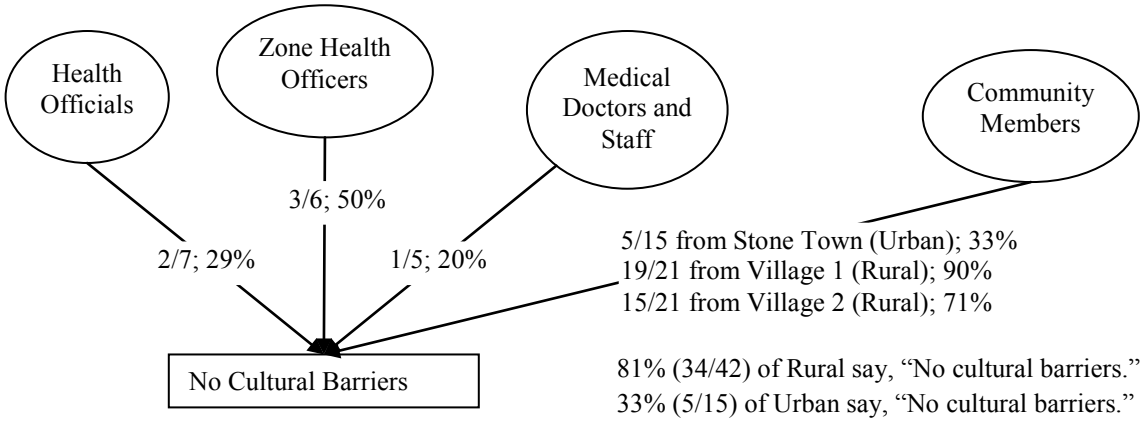

Figure 4. Visual Representation of Q3

The participants in this study described an educational need (i.e., making teaching opportunities available in the community) to address ill-constructed beliefs of malaria as a solution to all cultural barriers. Yet, the discrepancies between urban and rural constructed beliefs through socialization began to illustrate variation in thinking or perception of malaria (Figure 4). For example, the rural participants were more likely to say there are no cultural barriers, yet the urban participants described the rural communities as having cultural barriers. The thinking about malaria in a community is part of the culture of that community, and it continues to be passed along as part of the informal socialization processes unique to each community.

Current Policies in Zanzibar and Recommended Adaptations

Nations continue to evaluate the true nature of declining malaria cases in their countries. Following this trend, public health officials in Zanzibar also seek to uncover the underlying reason for declining malaria cases (e.g., ZMCP–Zanzibar Malaria Control Program; Ali, n.d.; PMI, n.d.a). The ZMCP now provides leadership to inform and guide decisions made by the Ministry of Health and Social Welfare concerning malaria control and elimination.

The President's Malaria Initiative

The United States is recognized in playing a part of Zanzibar's success by forming an interagency initiative entitled The President's Malaria Initiative (PMI). PMI is a highly rated scale up intervention in Zanzibar, focused on malaria eradication (PMI, n.d.a). The interventions within PMI are geared toward the most susceptible population groups, which are pregnant women and children under five years of age. The PMI has

established four highly effective malaria measures (PMI, n.d.a) that correspond with WHO findings: Indoor residual spraying, insecticide-treated nets (ITNs), malaria in pregnancy, and diagnosis and treatment. Additionally, PMI funds health education for malaria prevention training as a support to behavior change communication and social mobilization interventions (PMI, n.d.a). As an added precaution, PMI also protects the environment and people by promoting safe and careful use of pesticides.

Recommended Adaptations

This study recognizes culture as an added social determinant that influences the success of malaria interventions. Evaluating the PMI, this study begins to conceptualize solutions to enhance the initiative. In Table 7 presents the possible adaptations to the PMI aimed at enhancing PMI's ability to encourage more individuals to receive malaria treatment. Possible adaptations to PMI are rooted in necessary information gathering from Table 7's Cultural Practice Functionality column. Table 7 illustrates a community-based layer of involvement where constant clarification of malaria related misinformation and misconceptions occur, which can be addressed to develop a culture of learning and teaching about malaria interventions and the importance of such interventions.

Table 7

PMI Intervention + Cultural Practice Adaptations

Cultural practice functionality	Possible Adaptations to PMI
Access experts in the field concerning malaria in Zanzibar	Assessing the malaria PMC needs of the community
Case study data collection	Learning the cultural practices of the community
Evaluate Zanzibar cultural practices and the integration toward PMI interventions	Combining cultural practices with malaria PMC strategies
Apply new cultural practices in the form of goals to enhance malaria PMC efforts	Provide malaria PMC goal setting for the community
Teach the community by utilizing their culture, and especially children the need to take preventive measures against malaria	Train the next generation how their culture aligns with malaria PMC strategies

Note. PMC = prevention, management, and control; PMI = President's Malaria Initiative

For instance, health officials in Zanzibar are monitoring the practice of long-lasting insecticidal nets and have a goal of children and pregnant women usage at 95% of the total population by 2014. Baseline estimates in 2002, started with zero children (under age five) and 2.9% pregnant women using long-lasting insecticidal nets (Ali, n.d.a). Also, a vital component toward treating pregnant women is the use of sulfadoxine pyrimethamine treatments to protect mothers and babies from malaria (PMI, n.d.d). The balanced approach to use both rapid diagnostic tests and microscopy is also essential in proper diagnosis. The PMI appropriated funding for training. Finally, interventions such as the Indoor Residual Spraying are supported by USAID and provide a guide for pesticide management (USAID, 2013). Figure 5 illustrates PMI's inputs and four interventions (activities) contributing to desired outcomes and expected effects in Zanzibar.

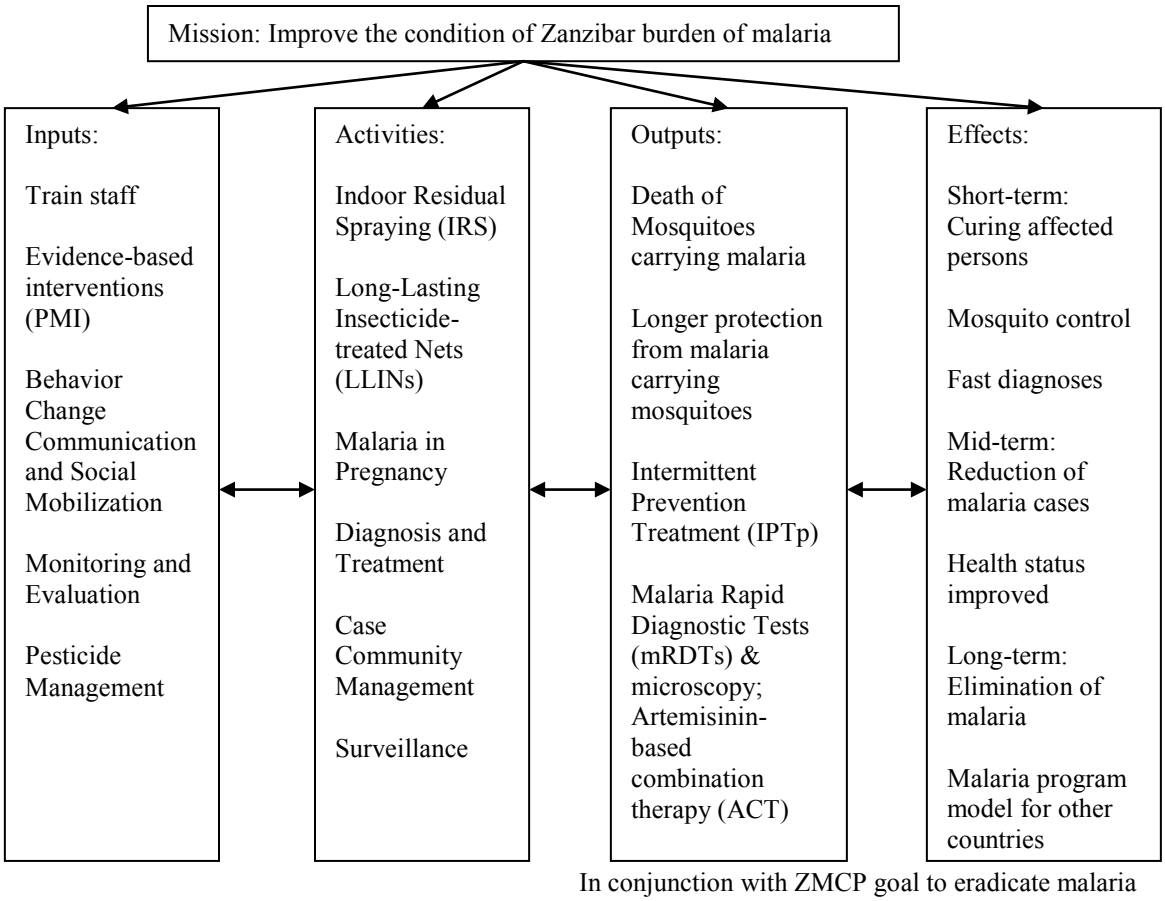

Figure 5. The President's Malaria Initiative (PMI)

Although the PMI represents Zanzibar's growing commitment to turn the tide against malaria, weaknesses remain. For instance, fear of major malaria resurgence remains and many malaria-infected people are not seeking medical attention right away. Findings here noted that 30% of Zanzibari citizens continue to seek traditional methods and healers as opposed to modern medicine. It is noteworthy that the majority (60%) who claim there are no cultural barriers were rural participants. In short, knowledge and beliefs related to "the right thinking" about malaria was considered a barrier described by urban respondents of what rural individuals needed.

If knowledge and belief discrepancies about malaria are present (i.e., rural versus urban), then any new interventions or adaptations to PMI need to address these regional differences. The PMI is missing a sufficient focus on cultural practices as expressed in Tables 5 and 6. PMI is effective after people have bought into the idea or have received health education, demonstrated by adoption of PMI strategies and establishment of malaria prevention habits. However individuals have often failed to follow best-practice behaviors routinely (Kamat, 2006). In short, indoor residual spraying, long-lasting insecticidal nets, addressing malaria during pregnancy, and diagnoses and treatment interventions are effective strategies, but a missing component of PMI is the inability to integrate interventions with Zanzibari cultural values.

PMI is heading in the right direction, and to date has made observable progress in increasing the population to move toward effective interventions, but the government needs help in selling this transition to the public. One suggestion would be to bring religious organizations into the program. Churches and mosques can reach out to educate individuals about malaria prevention and these types of organizations tend to recognize a social obligation to help those who experience malaria's burden of disease. Additionally, religious leaders can easily reach segments of the population and discuss any cultural barriers related to "is it right" to receive modern medicine. For example, Mfaume, Winch, Makemba, and Premji (1997) described the initiatives of mosques in Tanzania to educate the Muslim community about the necessity of mosquito nets.

On another helpful aspect, individual responsibility lies in the hands of the families and their household leaders. Interventions must recognize the roles of different

individuals in each culture to be successful. In short, the ecological sources of responsibility are numerous, yet to eradicate malaria, everyone needs to participate at the community level.

Study Limitations

Although this study did not specifically ask participants about policy issues, the intent was to reflect on policy as a result of participant's responses concerning malaria and cultural barriers. A more direct questioning of Groups 1 and 2 respondents could have provided insight concerning policy issues in Zanzibar. Yet, in this study the researcher reflects on what has been done in conjunction with participant responses in order to properly reflect on policy issues to address the overall effectiveness in Zanzibari malaria intervention activities.

While it is acknowledged that limited key informant data cannot be generalized to the population of the sub-Saharan Africa, this study serves as a starting point identifying regional cultural practices; especially, when the study draws upon theory of established determinants of behavior and behavior change (Fishbein, 2000). Further, the use of interviews allows for open-ended questions that meaningfully probe into the experiences, behaviors, and opinions of stakeholders. These findings provide a nice foundation for an expanded and more representative exploration of the degree to which identified cultural barriers must be considered in tailoring systemic efforts to eradicate malaria in locations like Zanzibar.

Also, the interviews were designed for 30–45 minutes, yet over time the process became more routine and time estimates ranged from 10–15 minutes. The reason for

shorter interview times occurring was a result of common emerging patterns across participants. The reoccurring of similar discussions across participants is a form of data saturation, meaning the number of participants in one location got to a point where new information was no longer reported. Generally, using the interview questions, data saturation occurred after the fifth participant interviewed in any one location based.

Conclusion

The PMI is described as highly effective, yet the strategies of malaria control are only as effective as the population changes behavior. In order to successfully reach and educate larger numbers of people, aggressive efforts to bring other support groups to the table and consideration of unique cultural barriers in the community must be integrated into new intervention strategies. For example, PMI was only effective after people bought into the idea. Although evidence suggests that many individuals have started adopting PMI strategies and habits for malaria protection, that adoption is far from universal and many people do not follow protocols all the time (Kamat, 2006). It would appear as though there is substantial variation in the impact of cultural barriers along the urban/rural continuum.

The literature clearly suggests that multi-faceted interventions are most effective (MPAC, 2013). The ability to educate and inform the community about bed-nets has improved sufficiently that health officials in Zanzibar are now setting a lofty goal of 95% adoption among high risk groups. This would never have been considered as recently as five years ago. Also, a vital component in treating pregnant women is the use of sulfadoxine pyrimethamine treatments to protect the mother and baby from malaria

(PMI, n.d.d). The balance approach to use both rapid diagnostic tests and microscopy is also essential in proper diagnosis and PMI continues to appropriate funding for future training. Finally, interventions such as indoor residual spraying are supported by USAID and provide a guide for pesticide management (USAID, 2013).

Culture can be described as acquired when individuals learn the attitudes, values, and behaviors in a community (i.e., socialization; Schaefer, 2008). In this way, through socialization individuals become educated. This study suggests that a cultural barrier to successful malaria control is more likely in rural settings. Ongoing malaria treatment and prevention in Zanzibar should consider traditional medicine as a barrier. While PMI has the potential for success, the probability of eradicating malaria is not assured, because people do not always choose to seek modern medical attention. Therefore, by addressing cultural factors that inhibit people from seeking medical attention, the resultant change agents can boost PMI results in malaria elimination. Integrating cultural practices with how malaria treatments are conducted has the potential to further reduce malaria's presence in Zanzibar. Success likely hinges on the degree to which cultural practices are appreciated and integrated into the delivery of services.

Implications

The implications drawn from this work suggest that successful eradication of malaria requires universal acceptance and utilization of best practices already validated elsewhere. However, the cultural regional differences between urban and rural communities accounted for barriers linked to the deep-rooted beliefs, thoughts, and practices about malaria. While this suggests a largely educational effort (or training

effort), use of other groups in the community (e.g., religious or tribal leaders) as team extenders could be critical as well.

Zanzibar can benefit greatly by making the necessary programmatic changes described in this study. For example: long lasting insect treated nets, residual spraying, artemisinin combination therapy, and rapid diagnostic testing are proven interventions, yet there remain cultural considerations that can enhance the adaptation and acceptance of these four interventions by the community, especially communities in Zanzibar. For example, the use of long lasting insecticide treated nets as fish nets or for gardening practices can be addressed by finding the underlying reason for misuse. By addressing these misconceptions and misuse of nets, a behavioral change could be made leading to a cultural shift in how individuals think about a malaria program and its' interventions. As for indoor residual spraying, artemisinin combination therapy, and rapid diagnostic testing, there is cultural distrust and disbelieve as to these interventions being effective. Additionally, policy should emphasize teaching younger people about malaria treatment and prevention, because this study also found men age 20 and younger who reside in rural areas tend to be less aware of malaria prevention, treatment, or control efforts. Zanzibar can experience extensive programmatic change by addressing the cultural misconceptions surrounding long-lasting insecticide treated nets, indoor residual spraying, artemisinin combination therapy, and rapid diagnostic testing. Further implications of programmatic change discussed in this study would ultimately lead to increased intervention successes.

CHAPTER V

CONCLUSION

The research took place in sub-Saharan Africa because literature has described the region as having the most malaria related deaths in the world (e.g., WHO, 2012a). Tanzania was chosen because it was one region not meeting current United Nations Millennium Development Goals concerning malaria. Zanzibar was selected as the research setting in consultation n with government officials interested in having a community health assessment of factors impacting malaria prevention and control efforts. There is no single Zanzibar malaria measure in World Health Organization reports because Zanzibar malaria statistics are included with Tanzania. In contrast to Tanzania, malaria has been almost eradicated in Zanzibar. However, the threat of reemergence remains a significant concern.

This dissertation study included a literature review, a key informant survey, and a policy reflection that examined cultural barriers to malaria control and prevention in Zanzibar. These three chapters served to make a regional cultural assessment of what more could be incorporated into Zanzibar's malaria initiatives. The idea to examine the extent of cultural barriers to malaria interventions arose from a pressing research need articulated by Zanzibar community leaders. In overseeing the Texas A&M University School of Rural Public Health's global health initiative, Dr. Abdulrasul Ramji became aware of the need for a regional assessment of whether cultural practices were impacted by cultural barriers. As a result, the three chapters contribute to a regional community

assessment of cultural practices that may inform the progress of malaria treatment and prevention in Zanzibar.

The literature review provided the first level of evidence about current malaria prevention and control initiatives in Zanzibar and the extent to which cultural practices had been examined as barriers to malaria treatment and prevention. A second study then furthered the investigation by entering the field (Zanzibar) and asking questions) about cultural practices acting as barriers in both an urban and rural setting, by utilizing key informant interviews of different stakeholder groups. In conjunction with key informant interviews, individuals in the community were also interviewed. The third policy-oriented study reviewed global and national policy efforts, and based on key informants' feedback concerning knowledge of cultural influences that might hinder the Zanzibari government's ability to eradicate malaria. This policy-oriented study provided recommendations for strengthening current malaria policy initiatives in Zanzibar.

Summary of Study Significance

While the role of cultural factors in malaria programs is noted globally (Mwenesi 2005), the research began with an examination of extant literature about malaria, and specifically malaria interventions in Zanzibar (Chapter 2). The lack of literature on the cultural barriers that hinder Zanzibari malaria interventions provided the rationale for conducting an "in-the-field" key informant study. Furthermore, the review findings (Chapter 2) validate other reasons to examine malaria policy issues in Zanzibar. The current course of action taken in Zanzibar is to accept mainstream malaria interventions. While malaria interventions in Zanzibar have recently been effective in helping eradicate

the disease, the question still remains, "What more can be done to sustain low rates of malaria from Zanzibar in light of concerns about a reemergence that may occur with potential changes in drug resistance to primary treatment methods or increased migration from more malaria prone areas?"

Clearly, malaria remains a health concern and further evaluations are necessary to both eliminate the disease's last remaining presence in Zanzibar, and to prepare for any reemergence. For that reason, Chapter 3 reflects a key informant strategy in a sub-Saharan African region to gather the opinions of different groups of community members concerning cultural practices and how such perspectives might influence the acceptability and effectiveness of different intervention approaches. A primary goal was to assess community views about the feasibility of incorporating cultural beliefs into future malaria interventions.

The key informant study of cultural practices presented in chapter 3 illustrates the importance of the integration of cultural practices with malaria control strategies as an ideal solution to effectively reach communities and enhance the effectiveness of interventions in Zanzibar. Support for this approach is provided by the work of Panter-Brick et al. (2006), who describe a novel approach for encouraging the rural community of Gambia to repair their bed nets.

In their study Panter-Bricker et al. developed strategies with the use of song in rural Gambia in order to instill malaria prevention strategies into the culture (Panter-Brick, Clarke, Lomas, Pinder, & Lindsay, 2006). The song encouraged the community to take an active approach to fixing their existing bed nets. Not surprisingly, children were

early adopters of the habit. Such interventions allow malaria prevention strategies to have greater impact on the community and represent new avenues for policy reform. The example of Panter-Brick et al. (2006) allows researchers to observe the process to integrate culture into current malaria interventions for wider reach and adoption of malaria preventive measures.

Chapter four offers suggestions towards aiding efforts to eradicate malaria in Zanzibar. Based on information provided in key informant interviews, the author hypothesizes that the President's Malaria Initiative can optimize its approach toward malaria elimination by integrating Zanzibar cultural practices into malaria prevention, management and control activities (PMC or prevention, management, and control).

Relevance of other Conceptual Frameworks

Adapted from the President's Malaria Initiative, Table 8 illustrates the ideology and impact associated with infusing Zanzibar culture with this initiative in order to strengthen the current interventions. The table documents four prevalent intervention approaches, proposes specific mechanisms for change that involve education and cultural transmission of knowledge, and poses hypothetical outcomes based on communication, implementation, and dissemination activities.

Table 8

PMI Intervention Components, Mechanisms for Change, and Implementation/Dissemination Elements

PMI intervention component	Mechanisms for change	Outcome*
IRS–Indoor Residual Spraying	Explain IRS is a preventive measure and not a way to avoid malaria treatment	Individuals recognize multiple methods are needed against malaria
LLINs–Long Lasting Insecticide treated Nets	Explain the proper use of LLINs to the community and assess how they teach their children	Generational transference of knowledge concerning the proper use of LLINs
Malaria and pregnancy	Encourage pregnant women to seek medical attention concerning malaria treatment	Pregnant women avoid health issues related to using traditional healers
Diagnosis and Treatment	Encourage segments of the community that treatment and diagnosis of malaria can be acceptable	Addressed issues related to mistrust or disbelief in malaria-related diagnostic testing

Source. PMI = President's Malaria Initiative. PMI (n.d.a).
* = Outcome is the end result of efforts related to communication, implementation, dissemination, or barriers. Mechanisms for change are based on cultural barriers identified in Zanzibar.

Through the use of the Reach Effectiveness Adoption Implementation Maintenance (RE-AIM) framework, the potential cultural enhancements to the President's Malaria Initiative s could be addressed. Briefly, RE-AIM is a five-step planning and evaluation model to translate research into action (Gaglio & Glasgow, 2012; Glasgow, McKay, Piette, & Reynolds, 2001). There are several examples of proper use of the RE-AIM and what it means to employ the RE-AIM framework as a planning and evaluation tool (e.g., Kessler, Purcell, Glasgow, Klesges, Benkeser, & Peek, 2012). The application of this framework can help elucidate effective strategies in reaching large population masses, getting culturally-sensitive interventions adopted by

government agencies, necessary considerations in pragmatic implementation of different intervention strategies, and long-term maintenance of intervention effects.

Internal Government Collaboration and Political Considerations

In retrospect, the history of malaria intervention in Tanzania dates back to the 1900s (Makundi, Mboera, Malebo, & Kitua, 2007). In the days when Tanzania was Tanganyika and Zanzibar was Arab Colony, British and German colonial masters introduced several policies to protect their health. One such example is Tanzania's National Malaria Control Program (NMCP), which currently proposes policy guidelines to the Ministry of Health and Social Welfare through the National Malaria Advisory Committee (NMAC). The NMAC is similar to Zanzibar Malaria Control Programme. In order to control and eventually eradicate malaria there must be collaboration and coordinated policies between Tanzania and Zanzibar. Although Zanzibar is technically a part of Tanzania, Tanzania allows Zanzibar to have its own governmental entity. However, there is constant human migration between the mainland (Tanzania) and Zanzibar, which pose a danger to malaria resurgences. With NMAC, Tanzania can leverage initiatives to reduce malaria cases, yet what sometimes hinders a government's handle on malaria initiatives are decentralization polices.

Makundi et al. (2007) discusses the decentralization policy of the Tanzania government where by local government can gain more power to scale up interventions when necessary–thus political action is necessary if effective disease management and control is to be achieved. Furthermore, a study in Colombia measured the associated malaria risk following the decentralization of departments and municipalities responsible

for protecting the people from malaria (Borrero, Carrasquilla, & Alexander, 2012). The results indicated that Colombians malaria risk increased as decentralization of the responsibility for malaria control occurred. As a result, decentralization polices can be harmful to the community and should be avoided or taken with severity due to the potential consequences.

Malaria conditions seem to be under control, yet this false sense of security introduces the danger. Zanzibar is an archipelago off the coast of Tanzania, where there is daily migration of people. The constant movement of people from Tanzania to Zanzibar introduces the real issue of malaria's potential to do harm (i.e., resurgence), which the Zanzibari government is constantly monitoring through the President's Malaria Initiative. This study confirms that individuals in Zanzibar think malaria is not a problem, which is a common belief that is transferred to younger generations. The younger generation might not always be aware of malaria prevention and treatment methods, especially in rural areas. This can be a critical issue since findings from Chapter 2 and 3 illustrate participants in rural settings are more at risk from malaria cases.

Study Strengths and Limitations

The three studies present different aspects of understanding the role of cultural practices in malaria prevention and control programs in Zanzibar. The first study, a literature review, provides a strong foundation from which to begin addressing cultural practices in Zanzibar. There is a lack of cultural studies related to malaria treatment and prevention in Zanzibar, and what does exists are cultural studies in other countries such

as described in Pankter-Brick et al. (2006). The second study, a key informant study of cultural practices, brings forth informative material to address if certain cultural practices are becoming barriers, and how cultural beliefs might be integrated into malaria prevention and control efforts. Building on the prior two studies, the third study examines the current policy Zanzibar has in place for malaria, in terms of adaptations that can include cultural changes for more community adaptation reach. The strength of the third study adds to the feasibility of enhancing interventions that are already working in Zanzibar.

This study had limitations derived from each of the study chapters (2, 3, and 4). In Chapter 2, the literature review sought to find the most readily available literature present, yet more time exploring different grey literature databases might have yielded different insights about cultural practices. Searches for grey literature were only done with the ProQuest search engine. Additionally, a quality or methodological assessment of the different studies included in the review was not conducted. Chapter 3 and 4 limitations involved the nature of the relatively small sample size of key informants, limiting the ability to generalize findings to a greater population sample, such as all of sub-Saharan Africa, as well as the trade off to conduct somewhat cursory key informant interviews rather than longer in-depth interviews, focus groups, or community participant research.

Recommendations for Practice, Policy, and Future Research

What derived from the three research studies (i.e., Chapter 2, 3, and 4) was a general roadmap that assessed malaria conditions in Zanzibar followed by discussions

with the community; and finally a reflection on malaria policies in place. The very process by which research was conducted in this study serves as a roadmap for other researchers to follow when evaluating the nature of malaria in a different region.

From the key informant study, there is evidence that rural settings receive information about malaria more slowly, and at times individuals in the rural setting do not follow the prescribed information. Therefore, a vital component to malaria interventions in a rural setting is the presence of evidence-based interventions and communication techniques for ensuring the rural community is receiving quality education that not only informs them regarding the initiation of malaria prevention and control behaviors but also helps to sustain these practices over time.

What these results imply is that policy should align with what people need. In this case, the rural community was generally lacking the educational foundation to understand the danger of malaria. One solution to cultural barriers is to provide a supportive environment for the exchange of conversation in order to point out misconceptions or misunderstandings. This is not to say education should override culture, but rather that education should be used to demonstrate that malaria prevention behavior can align with cultural belief. Furthermore, Chapter 4 gives an example of integrating cultural aspects of the community into malaria interventions.

A powerful cultural approach of introducing malaria interventions to the next generation is to teach them when they are children, especially in the form of stories and songs. In the key informant study, there was an emerging theme manifesting the notion that younger individuals did not have a clear understanding of malaria. In fact, several

youths below the age of 20 in a rural setting had no clue about malaria prevention or the causes of malaria. What was remarkable was that youths below 20 years of age began to ask questions concerning how to protect themselves. For this reason, this study strongly recommends that malaria interventions address generation-to-generation information dissemination.

In conducting this dissertation study, two possible avenues of future studies are worth mentioning: a) further studying cultural beliefs about malaria prevention and control in order to know how to more effectively introduce proposed malaria prevention and treatment intervention to different community stakeholders and vulnerable population groups; b) investigating the knowledge-base of both urban and rural youths concerning malaria prevention and treatment, and 3) designing studies to examine the most culturally appropriate strategies for reaching youth.

Concluding Thoughts

Continued surveillance is needed to understand how risks may change over time in Zanzibar. It is unconceivable that for the next 30 years malaria cases will remain at 1% in Zanzibar; thereby, leaving the youth 30 years later susceptible and vulnerable to future malaria resurgences. Yet, the danger lies in the false sense of security because in 30 years everyone that understood malaria well would have passed away or thought malaria was nothing to worry about.

Malaria interventions in Zanzibar should consider integrating cultural aspects of the community and developing a system by which one generation passes vital malaria information to the next generation. The cost and effort is too great to continually teach

mass populations about malaria every five to ten years. This approach is inefficient and does not utilize the most valuable aspect of a community–its people. The people can teach each other and contribute to improving their current health condition; this was evident through urban participant perspectives in their response to the time they take action after experiencing malaria-like symptoms (Chapter 3). However, rural participants would need further training that malaria is a serious illness and medical attention should be sought right away. With the notion of communities wanting to have better living conditions, a researcher can organize and instruct the community on how to retain valuable malaria information and teach it to their children.

Policy should not stop at the borders of urban settings, but continue to empower individuals of all communities (i.e., urban or rural). Interventions need to have different strategies when addressing urban versus rural settings, since in this study a growing difference of malaria knowledge between participants was forming from the data. Also, the solution lies in creating participation among the community to take up responsibility to inform the next generation about malaria. Non-government organization and governmental entities need to realize their impact is more powerful when they teach one generation to teach the next; thereby creating a continuous flow of vital information. In this way, a country can see the day malaria disappears from within its borders. Such a community empowering approach is not out of reach.

REFERENCES

Africa Fighting Malaria. (2008). Keeping malaria out of Zanzibar. Retrieved March 1, 2014 from http://www.fightingmalaria.org/pdfs/AFM_Zanzibar_March08.pdf

Ali, A. S. (n.d.). Wipe out malaria in Zanzibar. Retrieved June 13, 2013, from http://zmcp.go.tz/

Aneni, E. C., Hamer, D. H., & Gill, C. J. (2013). Systematic review of current and emerging strategies for reducing morbidity from malaria in sickle cell disease. *Tropical Medicine and International Health, 18*(3), 313-327. doi:10.1111/tmi.12056

Aregawi, M. W., Ali. A. S., Al-mafazy, A., Molteni, F., Katikiti, S., Warsame, M., Njau, R. J. A., . . . Otten, M. (2011). Reductions in malaria and anaemia case and death burden at hospitals following scale-up of malaria control in Zanzibar, 1999-2008. *Malaria Journal, 10*(46). doi:10.1186/1475-2875-10-46

Baltzell, K. A., Shakely, D., Hsiang, M., Kemere, J., Ali, A. S., Björkman, A., . . . Greenhouse, B. (2013). Prevalence of PCR detectable malaria infection among febrile patients with a negative Plasmodium falciparum specific rapid diagnostic test in Zanzibar. *The American Journal of Tropical Medicine and Hygiene, 88*(2), 289-291. doi: 10.4269/ajtmh.2012.12-0095

Bauch, J. A., Gu, J. J., Msellem, M., Mårtensson, A., Ali, A. S., Gosling, R., & Baltzell, K. A. (2013). Perception of malaria risk in a setting of reduced malaria

transmission: A qualitative study in Zanzibar. *Malaria Journal, 12*(75), 1-10. doi: 10.1186/1475-2875-12-75

Beer, N., Ali, A. S., de Savigny, D., Al-Mafazy, A. W., Ramsan, M., Abass, A. K., . . . Källander, K. (2010). System effectiveness of a targeted free mass distribution of long lasting insecticidal nets in Zanzibar, Tanzania. *Malaria Journal, 9*(173), 1-9. doi: 10.1186/1475-2875-9-173

Beer, N., Ali, A. S., Eskilsson, H., Jansson, A., Abdul-Kadir, F. M., Rotllant-Estelrich, G., . . . Källander, K. (2012). A qualitative study on caretakers' perceived need of bed-nets after reduced malaria transmission in Zanzibar, Tanzania. *BMC Public Health, 12*(606), 1-10. doi: 10.1186/1471-2458-12-606

Beer, N., Ali, A. S., Shakely, D., Elfving, K., Al-Mafazy, A. W., Msellem, M., . . . Källander, K. (2013). High effective coverage of vector control interventions in children after achieving low malaria transmission in Zanzibar, Tanzania. *Malaria Journal, 12*(38), 1-7. doi: 10.1186/1475-2875-12-38

Beer, N., Ali, A. S., Rotllant, G., Abass, A. K., Omari, R. S., Al-mafazy, A. W., . . . Källander, K. (2009). Adherence to artesunate-amodiaquine combination therapy for uncomplicated malaria in children in Zanzibar, Tanzania. *Tropical Medicine and International Health, 14*(7), 766-74. doi: 10.1111/j.1365-3156.2009.02289.x

Berg, J., Breederveld, D., Roukens, A. H., Hennink, Y., Schouten, M., Wendt, J. K., & Visser, L. G. (2011). Knowledge, attitudes, and practices toward malaria risk and prevention among frequent business travelers of a major oil and gas company.

Journal of Travel Medicine, 18(6), 395-401. doi: 10.1111/j.1708-8305.2011.00555.x

Bhattarai, A., Ali, A. S., Kachur, S. P., Mårtensson, A., Abbas, A. K., Khatib, R., . . . Björkman, A. (2007). Impact of artemisinin-based combination therapy and insecticide-treated nets on malaria burden in Zanzibar. *PLoS Medicine, 4*(11), 1784-1790. doi:10.1371/journal.pmed.0040309

Borrero, E., Carrasquilla, G., & Alexander, N. (2012). Decentralization and health system reform: What is their impact on malaria incidence in Colombian municipalities? *Biomedica, 32*(1), 68-78.

Caracelli, V. J., & Greene, J. C. (1993). Data analysis strategies for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 15*(2), 195-207.

Cavaco, I., Strömberg-Nörklit, J., Kaneko, A., Msellem, M. I., Dahoma, M., Ribeiro, V. L., . . . Gil, J. P. (2005). CYP2C8 polymorphism frequencies among malaria patients in Zanzibar. *Eur. J. Clin. Pharmacol, 61*(1), 15-18. doi 10.1007/s00228-004-0871-8

Cavaco, I., Piedade, R., Msellem, M. I., Björkman, A., & Gil, J. P. (2012). Cytochrome 1A1 and 1B1 gene diversity in the Zanzibar islands. *Tropical Medicine and International Health, 17*(7), 854-7. doi: 10.1111/j.1365-3156.2012.03011.x

Cleaver, H. (1977). Malaria and the political economy of public health. *International Journal of Health Services, 7*(4), 557-579.

Coetzee, M., & Koekemoer, L. L. (2013). Molecular systematics and insecticide resistance in the major African malaria vector, anopheles funestus. *Annu Rev Entomol, 58*:393-412. doi: 10.1146/annurev-ento-120811-153628

Cohen J., Smith D., Vallely A., Taleo G., Malefoasi G., & Sabot O. (2009). Holding the Line. In R. G. Feachem, A. A. Phillips, G. A. Targett (Eds.), *Shrinking the malaria map: A prospectus on malaria elimination* (pp. 40–60). San Francisco, CA: The Global Health Group, Global Health Sciences, University of California.

Cotter, J. V. (1986). *Mosquitoes and disease in the lower Rio Grande Valley, 1846-1986*. (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Full Text. (8705987)

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Thousand Oaks, CA: Sage.

Cusick, S. E., Tielsch, J. M., Ramsan, M., Jape, J. K., Sazawal, S., Black, R. E., & Stoltzfus, R. J. (2005). Short-term effects of vitamin A and antimalarial treatment on erythropoiesis in severely anemic Zanzibari preschool children. *Am. J. Clin. Nutr., 82*(2), 406-12.

Das, A., Gupta, R. K. D., Friedman, J., Pradhan, M. M., Mohapatra, C. C., & Sandhibigraha, D. (2013). Community perceptions on malaria and care-seeking practices in endemic Indian settings: Policy implications for the malaria control programme. *Malaria Journal, 12*(39), 1-12. doi: 10.1186/1475-2875-12-39

Djènontin, A., Chabi, J., Baldet, T., Irish, S., Pennetier, C., Hougard, J.M., . . . Chandre, F. (2009). Managing insecticide resistance in malaria vectors by combining

carbamate-treated plastic wall sheeting and pyrethroid-treated bed nets. *Malar J*, 8:233. doi:10.1186/1475-2875-8-233

D'Souza, B. J., & Newman, R. D. (2012). Strengthening the policy setting process for global malaria control and elimination. *Malaria Journal, 11*(28), 1-3. doi:10.1186/1475-2875-11-28

DaVanzo J., & Gertler P. (1996). Household production on health: A microeconomic perspective of health transitions. In J. Cleland & A. G. Hill (Eds.), *The health transition: Methods and procedures, health transition series #3* (pp. 85-101). Canberra, Australia: Australian National University Printing Service.

East African Network for Monitoring Antimalarial Treatment (EANMAT). (2003). The efficacy of antimalarial monotherapies, sulphadoxine-pyrimethamine and amodiaquine in East Africa: Implications for sub-regional policy. *Tropical Medicine and International Health, 8*(10), 860-867.

Febir, L. G., Asante, K. P., Dzorgbo, D. S., Senah, K. A., Letsa, T. S., & Owusu-Agyei, S. (2013). Community perceptions of a malaria vaccine in the Kintampo districts of Ghana. *Malaria Journal, 12*(156), 1-10. doi: 10.1186/1475-2875-12-156

Ferreira, P. E., Veiga, M. I., Cavaco, I., Martins, J. P., Andersson, B., Mushin, S., . . . Gil, J. P. (2008). Polymorphism of antimalaria drug metabolizing, nuclear receptor, and drug transport genes among malaria patients in Zanzibar, East Africa. *Ther Drug Monit, 30*(1), 10-15. doi: 10.1097/FTD.0b013e31815e93c6

Fishbein, M. (2000). The role of theory in HIV prevention. *AIDS Care, 12*(3), 273-278. doi: 10.1080/09540120050042918

Fivawo, M. (1986). *Community response to malaria: Muhenza District, Tanzania 1983-84. A study in cultural adaptation*. Urbana Champaign, IL: University of Illinois.

Fröberg, G., Jörnhagen, L., Morris, U., Shakely, D., Msellem, M. I., Gil, J. P., . . . Mårtensson, A. (2012). Decreased prevalence of plasmodium faciparum resistance markers to amodiaquine despite its wide scale use as ACT partner drug in Zanzibar. *Malaria Journal, 11*(321), 1-5. doi: 10.1186/1475-2875-11-321

Gaglio, B., & Glasgow, R. E. (2012). Evaluation approaches for dissemination and implementation research. In R. Brownson, G. Colditz, & E. Proctor (Eds.). *Dissemination and implementation research in health: Translating science to practice* (pp. 327-356). New York, NY: Oxford University Press.

Ghosh, S. K., Patil, R. R., & Tiwari, S. N. (2012). Socio-economic-political-cultural aspects in malaria control programme implementation in Southern India. *Journal of Parasitology Research, 2012*(317908), 1-3. doi: 10.1155/2012/317908

Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Methods of data collection in qualitative research: Interviews and focus groups. *British Dental Journal, 204*(6), 291-295. doi: 10.1038/bdj.2008.192

Glasgow, R. E., McKay, H. G., Piette, J. D., & Reynolds, K. D. (2001). The RE-AIM framework for evaluating interventions: What can it tell us about approaches to chronic illness management? *Patient Education and Counseling, 44*(2), 119-27.

Gosoniu, L., Msengwa, A., Lengeler, C., & Vounatsou, P. (2012). Spatially explicit burden estimates of malaria in Tanzania: Bayesian geostatistical modeling of the

malaria indicator survey data. *PLoS Medicine, 7*(5), 1-9. doi: 10.1371/journal.pone.0023966

Greenwood, B. M. (2008). Control to elimination: Implications for malaria research. *Trends in Parasitology, 24*(10), 449-454. doi:10.1016/j.pt.2008.07.002

Gulland, A. (2012). Fight against malaria slowed in 2012 as funding fell. *British Medical Journal, 345*(e8569). doi: 10.1136/bmj.e8569

Hargreaves, K., Koekemoer, L. L., Brooke, B. D., Hunt, R. H., Mthembu, J., & Coetzee, M. (2000). Anopheles funestus resistant to pyrethroid insecticides in South Africa. *Med Vet Entomol, 14*(2):181-189.

Harvey, S. A. (2006). *The whole world will be able to see us: Cultural factors affecting insecticide-treated bed net use for malaria control in the Peruvian Amazon*. (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Full Text. (3245521)

Hausmann-Muela, S., Ribera, J. M., & Tanner, M. (1998). Fake malaria and hidden parasites: The ambiguity of malaria. *Anthropology and Medicine*, 5:43-61.

Helitzer-Allen, D. L. (1989). *Examination of the factors influencing the utilization of the antenatal malaria chemoprophylaxis program, Malawi, Central Africa*. Baltimore, MD: Johns Hopkins University.

Holt, R. A., Subramanian, G. M., Halpern, A., Sutton, G. G., Charlab, R., Nusskern, D. R., . . . Hoffman, S. L. (2002). The genome sequence of the malaria mosquito anopheles gambiae. *Science, 298*(5591), 129-149. doi: 10.1126/science.1076181

Hsieh, H., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277-1288. doi: 10.1177/1049732305276687

Hunt, R. H., Fuseini, G., Knowles, S., Stiles-Ocran, J., Verster, R., Kaiser, M. L., . . . Coetzee, M. (2011). Insecticide resistance in malaria vector mosquitoes at four localities in Ghana, West Africa. *Parasit Vectors*, *4*:107. doi:10.1186/1756-3305-4-107

Iannotti, L. L., Tielsch, J. M., Black, M. M., & Black, R. E. (2006). Iron supplementation in early childhood: Health benefits and risks. *Am. J. Clin. Nutr., 84*(6), 1261-76.

Institute of Medicine (IOM). (1991). Malaria: Obstacles and opportunities. S. C. Oaks, Jr., V. S. Mitchell, G. W. Pearson, and C. C. J. Carpenter (Eds.). *A report of the committee for the study on malaria prevention and control: Status review and alternative strategies*. Washington, D.C.: National Academy Press.

International Labour Office, Social Security Department Zanzibar. (2010). Social protection expenditure and performance review and social budget. International Labour Office, Social Security Department. Geneva: ILO. Retrieve March 1, 2014, from http://www.ilo.org/wcmsp5/groups/public/---ed_protect/---secsoc/documents/publication/wcms_secsoc_14310.pdf

Jaenisch, T., Sullivan, D. J., Dutta, A., Deb, S., Ramsan, M., Othman, M. K., . . . Sazawal, S. (2010). Malaria incidence and prevalence on Pemba Island before

the onset of the successful control intervention on the Zanzibar archipelago. *Malaria Journal, 9*(32), 1-10. doi: 10.1186/1475-2875-9-32

Jombo, G. T. A., Mbaawuaga, E. M., Denen Akaa, P., Alao, O. O., Peters, E. J., Dauda, M. A., . . .Yaakugh, J. B. (2010). Choices of drugs for self-treatment of malaria among adult women in a Nigerian city: Implications for the success of the ongoing 'roll back' malaria programme. *Int J Biol Med Res*., *2*(6):57-63.

Jones, C.M., Haji, K.A., Khatib, B.O., Bagi, J., Mcha, J., Devine, G. J., . . . Ranson, H. (2013). The dynamics of pyrethroid resistance in anopheles arabiensis from Zanzibar and an assessment of the underlying genetic basis. *Parasites & Vectors*, *6*:343. doi:10.1186/1756-3305-6-343

Kamat, V. R. (2006). "I thought it was only ordinary fever!" Cultural knowledge and the micropolitics of therapy seeking for childhood febrile illness in Tanzania. *Social Science & Medicine, 62*(12), 2945–2959. doi: 10.1016/j.socscimed.2005.11.042.

Kaufman, M. R., Rweyemamu, D., Koenker, H., & Macha, J. (2012). "My children and I will no longer suffer from malaria": A qualitative study of the acceptance and rejection of indoor residual spraying to prevent malaria in Tanzania. *Malaria Journal, 11*(220), 1-17. doi: 10.1186/1475-2875-11-220

Kessler, R. S., Purcell, E. P., Glasgow, R. E., Klesges, L. M., Benkeser, R. M., & Peek, C. J. (2012). What does it mean to "employ" the RE-AIM model? *Evaluation & the Health Professions, 36*(1), 44-66. doi: 10.1177/0163278712446066

Khaireh, B. A., Assefa, A., Guessod, H. H., Basco, L. K., Khaireh, M. A., Pascual, A., . . . Bogreau, H. (2013). Population genetics analysis during the elimination process

of plasmodium falciparum in Djibouti. *Malaria Journal, 12*(201), 1-14. doi: 10.1186/1475-2875-12-201

Kiviat, E. (1991). *Wetland human ecology*. (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Full Text. (9211445)

Koekemoer, L. L., Spillings, B. L., Christian, R., Lo, T. M., Kaiser, M. L., Norton, R. A. I., . . . Coetzee, M. (2011). Multiple insecticide resistance in anopheles gambiae (Diptera: Culicidae) from Pointe Noire, Republic of the Congo. *Vector-Borne Zoo Dis*, *11*(8):1193-1200. doi:10.1089/vbz.2010.0192

Lemnge, M. M., Ali, A. S., Malecela, E. K., Sambu, E., Abdulla, R., Juma, M. S., . . . Njau, R. J. (2005). Therapeutic efficacy of sulfadoxine-pyrimethamine and amodiaquine among children with uncomplicated plasmodium falciparum malaria in Zanzibar, Tanzania. *Am. J. Trop. Med. Hyg., 73*(4), 681-685.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Loannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: Explanation and elaboration. *British Medical Journal, 339*. doi: 10.1136/bmj.b2700

Mabaso, M. L., Sharp, B., & Lengeler, C. (2004). Historical review of malarial control in southern African with emphasis on the use of indoor residual house-spraying. *Tropical Medicine and International Health, 9*(8), 846-56.

Makundi, E. A., Mboera, L. E., Malebo, H. M., & Kitua, A. Y. (2007). Priority setting on malaria interventions in Tanzania: Strategies and challenges to mitigate against the intolerable burden. *Am. J. Trop. Med. Hyg., 77* (6), 106-111.

Malaria Policy Advisory Committee and Secretariat (MPAC). (2012a). Inaugural meeting of the malaria policy advisory committee to the WHO: Conclusions and recommendations. *Malaria Journal, 11*(137), 1-7. doi:10.1186/1475-2875-11-137

Malaria Policy Advisory Committee and Secretariat (MPAC). (2012b). Malaria policy advisory committee to the WHO: Conclusions and recommendations of September 2012 meeting. *Malaria Journal, 11*(424), 1-9. doi:10.1186/1475-2875-11-424

Malaria Policy Advisory Committee and Secretariat (MPAC). (2013). Malaria policy advisory committee to the WHO: Conclusions and recommendations of March 2013 meeting. *Malaria Journal, 12*(213), 1-11. doi:10.1186/1475-2875-12-213

van Manen, M. (1990). *Researching lived experience: Human science for an action sensitive pedagogy*. Albany, NY: State University of New York Press.

Marinotti, O., Cerqueira, G. C., de Almeida, L. G. P., Ferro. M. I. T., Loreto, E. L. S., Zaha, A., . . . de Vasconcelos, A. T. R. (2013). The genome of anopheles dalingi, the main neotropical malaria vector. *Nucleic Acids Research*, 1-14. doi:10.1093/nar/gkt484

Marshall, C., & Rossman, G. B. (2010). *Designing qualitative research* (5th ed.). Thousand Oaks, CA: Sage.

Mårtensson, A., Strömberg, J., Sisowath, C., Msellem, M. I., Gil, J. P., Montgomery, S. M., . . . Björkman, A. (2005). Efficacy of artesunate plus amodiaquine versus that of artemether-lumefantrine for the treatment of uncomplicated childhood plasmodium falciparum malaria in Zanzibar, Tanzania. *Clinical Infectious Diseases, 41*(8), 1079-86.

Maxwell, J. (2005). *Qualitative research design: An interactive approach* (2nd ed.). Thousand Oaks, CA: Sage.

McElroy, P. (n.d.). Zanzibar: Beyond malaria control. Retrieved June 13, 2013, from http://www.pmi.gov/countries/profiles/zanzibar.html

McMorrow, M. L., Masanja, M. I., Abdulla, S. M., Kahigwa, E., & Kachur, S. P. (2008). Challenges in routine implementation and quality control of rapid diagnostic tests for malaria-Rufiji District, Tanzania. *Am J Trop Med Hyg*, *79*(3):385-90.

Mebrahtu, T., Stoltzfus, R. J., Chwaya, H. M., Jape, J. K., Savioli, L., Montresor, A., . . . Tielsch, J. M. (2004). Low-dose daily iron supplementation for 12 months does not increase the prevalence of malarial infection or density of parasites in young Zanzibari children. *The Journal of Nutrition, 134*(11), 3037-41.

Mfaume, M. S., Winch, P. J., Makemba, A. M., & Premji, Z. (1997). Mosques against malaria. *World Health Forum, 18*(1), 35-38.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med, 6*(7): e1000097. doi:10.1371/journal.pmed.1000097

Morgan, J. C., Irving, H., Okedi, L. M., Steven, A., & Wondji, C. S. (2010). Pyrethroid resistance in an anopheles funestus population from Uganda. *PLoS One*, *5*:e11872. doi: 10.1371/journal.pone.0011872

Morris, U., Aydin-Schmidt, B., Shakely, D., Mårtensson, A., Jörnhagen, L., Ali, A. S., . . . Björkman, A. (2013). Rapid diagnostic tests for molecular surveillance of plasmodium falciparum malaria-assessment of DNA extraction methods and field applicability. *Malaria Journal, 12*(106), 1-6. doi: 10.1186/1475-2875-12-106

Msellem, M. I., Mårtensson, A., Rotllant, G., Bhattarai, A., Strömberg, J., Kahigwa, E., . . . Björkman, A. (2009). Influence of rapid malaria diagnostic tests on treatment and health outcome in fever patients, Zanzibar: A crossover validation study. *PLoS Medicine, 6*(4), 1-9. doi: 10.1371/journal.pmed.1000070

Mwenesi, H. A. (2005). Social science research in malaria prevention, management and control in the last two decades: An overview. *Acta Tropica, 95*(3), 292-7. http://dx.doi.org/10.1016/j.actatropica.2005.06.004

Neal, M. (2013). Engaging students through effective questions. *Education Canada Magazine*, *53*(5). Retrieved December 9, 2013, from http://www.cea-ace.ca/education-canada/article/engaging-students-through-effective-questions

Ng'ang'a, P. N., Jayasinghe, G., Kimani, V., Shililu, J., Kabutha, C., Kabuage, L., Githure, J., & Mutero, C. (2009). Bed net use and associated factors in a rice farming community in Central Kenya. *Malaria Journal, 8*(64), 1-8. doi:10.1186/1475-2875-8-64

Norris, L. C., & Norris, D. E. (2011). Insecticide resistance in culex quinquefasciatus mosquitoes after the introduction of insecticide-treated bed nets in Macha, Zambia. *J Vector Ecol*, *36*:411-420. doi: 10.1111/j.1948-7134.2011.00182.x

Nsimba, S. E. D., & Kayombo E. J. (2008). Sociocultural barriers and malaria health care in Tanzania. *Evaluation & Health Professions*, *31*(3):318-322. doi: 10.1177/0163278708320164

Ojakaa, D., Yamo, E., Collymore, Y., Ba-Nguz, A., & Bingham, A. (2011). Perceptions of malaria and vaccines in Kenya. *Human Vaccine, 7*(10), 1096-9. doi: 10.4161/hv.7.10.17496

Pankter-Brick, C., Clarke, S. E., Lomas, H., Pinder, M., & Lindsay, S. W. (2006). Culturally compelling strategies for behaviour change: A social ecology model and case study in malaria prevention. *Social Science & Medicine, 62*(2006), 2810-2825. doi:10.1016/j.socscimed.2005.10.009

Pindolia, D. K., Garcia, A. J., Wesolowski, A., Smith, D. L., Buckee, C. O., Noor, A. M., Snow, R. W., & Tatem, A. J. (2012). Human movement data for malaria control and elimination strategic planning. *Malaria Journal, 11*(205), 1-16. doi: 10.1186/1475-2875-11-205

President's Malaria Initiative (PMI). (n.d.a). About the president's malaria initiative. Retrieved June 13, 2013, from http://www.pmi.gov/about/index.html

President's Malaria Initiative (PMI). (n.d.b). Tanzania country profile. Retrieved June 13, 2013, from http://www.pmi.gov/countries/profiles/tanzania.html

President's Malaria Initiative (PMI). (n.d.c). FY08 malaria operational plan, Tanzania. November 2007, USAID, Washington DC. Retrieved June 13, 2013, from http://www.fightingmalaria.gov/countries/tanzania_mop-fy08.pdf

President's Malaria Initiative (PMI). (n.d.d). Malaria in pregnancy. Retrieved June 8, 2013, from http://www.pmi.gov/technical/pregnant/index.html

Pringle, J., Hendry, C., & McLafferty, E. (2011). Phenomenological approaches: Challenges and choices. *Nurse Researcher, 18*(2), 7-18.

Putsch, R. W. III, & Joyce, M. (1990). Dealing with patients from other cultures. In H. K. Walker, W. D. Hall, & J. W. Hurst (Eds.), *Clinical methods: The history, physical, and laboratory examinations, 3rd ed*. (1050-1065). Boston, MA: Butterworths.

Rajaratnam, J. K., Marcus, J. R., Flaxman, A. D., Wang, H., Levin-Rector, A., Dwyer, L., Costa, M., Lopez, A. D., & Murray, C. J. L. (2010). Neonatal, postneonatal, childhood, and under-5 mortality for 187 countries, 1970-2010: A systematic analysis of progress towards millennium development goal 4. *The Lancet, 375*(9730), 1988-2008. http://dx.doi.org/10.1016/S0140-6736(10)60703-9

Ranson, H., N'Guessan, R., Lines, J., Moiroux, N., Nkuni, Z., & Corbel, V. (2010). Pyrethroid resistance in African anopheline mosquitoes: What are the implications for malaria control? *Trends Parasitol, 27*(2):91-98. doi: 10.1016/j.pt.2010.08.004

Revolutionary Government of Zanzibar, Ministry of Health. (2011). *Zanzibar malaria program performance review: Strengthening health systems and community*

based malaria control and elimination: Towards a malaria free Zanzibar. Retrieved July 21, 2013, from http://www.rbm.who.int/countryaction/aideMemoire/Zanzibar-The-malaria-program-performance-review-2010.pdf

Roberts, L., & Enserink, M. (2007). Did they really say. . . eradication? *Science 318*(5856), 1544–1545. doi: 10.1126/science.318.5856.1544

Rodriguez, L. A., Sana, M., & Sisk, B. (2015). Self-administered questions and interviewer-respondent familiarity. *Field Methods (Forthcoming)*. Unpublished manuscript, Vanderbilt University. Retrieved from academia.edu.

Sarrassat, S., Senghor, P., & Le Hesran, J. Y. (2008). Trends in malaria morbidity following the introduction of artesunate plus amodiaquine combination in M'lomp village dispensary, south-western Senegal. *Malaria Journal, 7*(215), 1-8. doi: 10.1186/1475-2875-7-215

Sazawal, S., Black, R. E., Ramsan, M., Chwaya, H. M., Dutta, A., Dhingra, U., . . . Kabole, F. M. (2007). Effect of zinc supplementation on mortality in children aged 1-48 months: A community-based randomized placebo-controlled trial. *Lancet, 369*(9565), 927-34.

Sazawal, S., Black, R. E., Ramsan, M., Chwaya, H. M., Stoltzfus, R. J., Dutta, A., . . . Kabole, F. M. (2006). Effects of routine prophylactic supplementation with iron and folic acid on admission to hospital and mortality in preschool children in a high malaria transmission setting: Community-based, randomized, placebo-controlled trial. *Lancet, 367*(9505), 133-43.

Sisowath, C., Strömberg, J., Mårtensson, A., Msellem, M., Obondo, C., Björkman, A., & Gil, J. P. (2005). In vivo selection of plasmodium falciparum pfmdr1 86N coding alleles by artemether-lumefantrine (Coartem). *The Journal of Infectious Diseases, 191*(6), 1014-7.

Sisowath, C., Ferreira, P. E., Bustamante, L. Y., Dahlström, S., Mårtensson, A., Björkman, A., . . . Gil, J. P. (2007). The role of pfmdr1 in plasmodium falciparum tolerance to artemether-lumefantrine in Africa. *Tropical Medicine and International Health, 12*(6), 736-42. doi:10.1111/j.1365-3156.2007.01843.x

Smith, D. L., Cohen, J. M., Moonen, B., Tatem, A. J., Sabot, O. J., Ali, A., & Mugheiry, S. M. (2011). Infectious disease. Solving the sisyphean problem of malaria in Zanzibar. *Science, 332*(6036), 1384-5. doi: 10.1126/science.1201398

Sousa-Figueiredo, J. C., Basáñez, M. G., Mgeni, A. F., Khamis, I. S., Rollinson, D., & Stothard, J. R. (2008). A parasitological survey, in rural Zanzibar, of pre-school children and their mothers for urinary schistosomiasis, soil-transmitted helminthiases and malaria, with observations on the prevalence of anaemia. *Annals of Tropical Medicine & Parasitology, 102*(8), 679-692. doi: 10.1179/136485908X337607

Ssengonzi, R., & Makumbi, F. (2010). Assessing the effect of a combined malaria prevention education and free insecticide-treated bed nets program on self-reported malaria among children. Research Triangle Park, NC: RTI International Press.

Stevenson, E. G. J. (2011). *Schooling and life chances: Explaining the effects of mothers' schooling on child health in Ethiopia*. (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Full Text. (3465306)

Stoltzfus, R. J., Heidkamp, R., Kenkel, D., & Habicht, J. P. (2007). Iron supplementation of young children: Learning from the new evidence. *Food and Nutrition Bulletin, 28*(4), S572-S584.

Stothard, J. R., Mook, P., Mgeni, A. F., Khamis, I. S., Khamis, A. N., & Rollinson, D. (2006). Control of urinary schistosomiasis on Zanzibar (Unguja Island): A pilot evaluation of the educational impact of the Juma na Kichocho health booklet within primary schools. *Mem Inst Oswaldo Cruz, Rio de Janeiro, 101*(1), 119-124.

Strassburg, M. A. (1982). The global eradication of smallpox. *American Journal of Infection Control, 10*(2), *53-59.*

Talisuna, A. O., Adibaku, S., Amojah, C. N., Amofah, G. K., Aubyn, V., Dodoo, A., . . . Shija, S. J. (2012). The affordable medicines facility-malaria—a success in peril. *Malaria Journal, 11*(370), 1-3. doi: 10.1186/1475-2875-11-370

Tanner, M., & Vlassoff, C. (1998). Treatment seeking behaviour for malaria: a typology based on endemicity and gender. *Soc Sci Med*, 46:523-532. doi:10.1186/1475-2875-12-132

Tanzania Country Report on the Millennium Development Goals 2010. (2011). *MDG report 2010.* Retrieved March 13, 2014, from http://www.povertymonitoring.go.tz/WhatisNew/MDG%20Report%202010.pdf

Tanzania National Bureau of Statistics and ORC Macro. (2005). *Tanzania demographic and health survey 2004-05*. Dar es Salaam, Tanzania: National Bureau of Statistics and ORC Macro. Retrieved March 12, 2014 from http://dhsprogram.com/pubs/pdf/FR173/FR173-TZ04-05.pdf

Tatem, A. J., Qiu, Y., Smith, D. L., Sabot, O., Ali, A. S., & Moonen, B. (2009). The use of mobile phone data for the estimation of the travel patterns and imported plasmodium falciparum rates among Zanzibar residents. *Malaria Journal, 8*(287), 1-12. doi: 10.1186/1475-2875-8-287

The Access Project. (1999). *Getting the lay of the land on health: A guide for using interviews to gather information (key informant interviews).* Boston, MA: The Robert Wood Johnson Foundation, in partnership with Brandeis University's Heller Graduate School and the Collaborative for Community Health Development.

Thompson, B. (2006). *Foundations of behavioral statistics: An insight-based approach*. New York, NY: The Guilford Press.

Torgerson, C. J. (2003). *Systematic reviews*. London: Continuum Books.

Tougher, S., ACTwatch Group, Ye, Y., Amuasi, J. H., Kourgueni, I. A., Thomson, R., . . . Hanson, K. (2012). Effect of the affordable medicines facility—malaria (AMFm) on the availability, price, and market share of quality-assured artemisinin-based combination therapies in seven countries: A before-and-after analysis of outlet survey data. *Lancet, 380*(9857), 1916-26. doi: 10.1016/S0140-6736(12)61732-2

Tripet, F., Wright, J., Cornel, A., Fofana, A., McAbee, R., Meneses, C., . . . Lanzaro, G. (2007). Longitudinal survey of knockdown resistance to pyrethroid (kdr) in Mali, West Africa, and evidence of its emergence in the Bamako form of anopheles gambiae s.s. *AmJTrop Med Hyg*, *76*:81-87.

Tynan, A., Atkinson, J., Toaliu, H., Taleo, G., Fitzgerald, L., Whittaker, M., Riley, I., Schubert, M., & Vallely, A. (2011). Community participation for malaria elimination in tafea province, Vanuatu: part II. Social and cultural aspects of treatment-seeking behaviour. *Malaria Journal, 10*(204), 1-12. doi: 10.1186/1475-2875-10-204

United States Agency for International Development (USAID). (2013). Indoor residual spraying (IRS) 2 for malaria control: Indefinite quantity contract (IQC) task order I. Research Triangle Park, NC: RTI International. Contract GHN-I-00-09-00012-00. Retrieved June 8, 2013, from http://www.pmi.gov/technical/irs/index.html

USAID Center for Development Information and Evaluation. (1996). *Conducting key informant interviews.* Performance monitoring and evaluation tips, Number 2. Washington, DC: U.S. Agency for International Development. PN-ABS-541.

Valecha, N., Looareesuwan, S., Martensson, A., Abdulla, S. M., Krudsood, S., Tangpukdee, N., . . . Björkman, A. (2010). Arterolane, a new synthetic trioxolane for treatment of uncomplicated plasmodium falciparum malaria: A phase II, multicenter, randomized, dose-finding clinical trial. *Clinical Infectious Diseases, 51*(6), 684-691. doi: 10.1086/655831

VanderKnyff, J. (2007). *Barriers to health and healthcare access in Dominican Bateys*. (Master thesis). Retrieved from ProQuest Dissertations & Theses Full Text. (1462508)

Williams, H. A., & Jones, C. O. H. (2004). A critical review of behavioral issues related to malaria control in sub-Saharan Africa: What contributions have social scientists made? *Social Science & Medicine, 59*(3), 501-523.

World Health Organization (WHO). (n.d.a). *Rapid access expansion 2015 programme (RAcE 2015).* Retrieved March 1, 2014, from http://www.who.int/malaria/areas/rapid_access_expansion_2015/en/index.html

World Health Organization (WHO). (n.d.b). *Malaria: Areas of work.* Retrieved July 9, 2013, from http://www.who.int/malaria/areas/en/

World Health Organization (WHO). (2005). *The roll back malaria strategy for improving access to treatment through home management of malaria*. Geneva, Switzerland: WHO Press. Retrieved July 9, 2013, from http://whqlibdoc.who.int/hq/2005/WHO_HTM_MAL_2005.1101.pdf

World Health Organization (WHO). (2010). *Guidelines for the treatment of malaria* (2nd ed.). Geneva, Switzerland: WHO Press. Retrieved July 9, 2013, from http://whqlibdoc.who.int/publications/2010/9789241547925_eng.pdf

World Health Organization (WHO). (2011a). *World malaria report 2011.* Geneva, Switzerland: WHO Press. Retrieved June 5, 2013, from http://www.who.int/malaria/world_malaria_report_2011/en/

World Health Organization (WHO). (2011b). *Universal access to malaria diagnostic testing: An operational manual.* Geneva, Switzerland: WHO Press. Retrieved July 9, 2013, from http://whqlibdoc.who.int/publications/2011/9789241502092_eng.pdf

World Health Organization (WHO). (2012a). *World malaria report 2012.* Geneva: World Health Organization. Retrieved June 5, 2013, from http://www.who.int/malaria/publications/world_malaria_report_2012/wmr2012_full_report.pdf

World Health Organization (WHO). (2012b). *T3: Test. Treat. Track. Scaling up diagnostic testing, treatment and surveillance for malaria.* Geneva, Switzerland: WHO Press. Retrieved July 9, 2013, from http://www.who.int/malaria/publications/atoz/test_treat_track_brochure.pdf

World Health Organization & UNICEF. (2012). *An equity-focused strategy to improve access to essential treatment services for children.* Geneva, Switzerland: WHO Press. Retrieved July 9, 2013, from http://www.who.int/maternal_child_adolescent/documents/statement_child_services_access_whounicef.pdf

Zanzibar Malaria Control Programme (ZMCP). (n.d.). Zanzibar 2000-08 morbidity, mortality. Retrieved June 13, 2013, from http://zmcp.go.tz/docs/fig1.pdf

Zanzibar Malaria Control Programme (ZMCP). (2010). Zanzibar malaria early epidemic detection system biannual report, *year-end 2009, 1*(2), 1-48. Retrieved June 13, 2013, from http://zmcp.go.tz/docs/surveillance-report2_14apr1.pdf

Zanzibar National malaria Control Program (ZNMCP). (2007). Zanzibar: Overcoming challenges to maintain SUFI presentation to East African Regional Network (EARN). Retrieved March 1, 2014 from http://www.rbm.who.int/countryaction/docs/earn/7earn2007Zanzibar.ppt#256,1, Zanzibar

APPENDIX A

Systematic Review Protocol Coding Sheet			
Screening questions			
1	Is the study about malaria?		Yes or No
2	Is the study conducted in Zanzibar?		Yes or No
3	Is the study empirical?		Yes or No
4	Is the study within the last 10 years?		Yes or No
5	Does the study reflect an intervention activity		Yes or No
Data extraction questions Fill in the information in the space provided			
6	Describe the malaria topic or focus?		
7	Describe the intervention activity?		
8	Are any barriers to intervention activity explained?		Yes or No
	If yes, then provide a description		
9	If any barriers to intervention activity are described as cultural, then identify here.		
10	Are any programs described in the study?		Yes or No
	If yes, then provide a description		
11	Was the intervention considered effective by the authors?		Yes or No

APPENDIX B

INTERVIEW QUESTIONS IN ENGLISH/SWAHILI

Interview Questions

Interview questions in English	
(1)	How bad is malaria here in Zanzibar?
(2)	How does Zanzibar combat against malaria?
(3)	Do you think cultural practices hinder individuals from receiving malaria treatment?
(4)	What cultural practices would keep people from seeking malaria treatment?
(5)	Do you think current interventions for malaria control can also be culturally sensitive*(e.g., how might interventions take account of underlying cultural practices?
(6)	What is your opinion about integrating culture with malaria interventions?
(7)	What culture issues would discourage individuals from seeking malaria treatment? Is malaria considered an issue to take care of right way?
(8)	Will the community accept malaria treatment, if we introduce cultural sensitivity* into future inventions?
(9)	How do you know if you have malaria? What prompts you to seek medical attention?
Interview questions in Swahili – Sehemu ya pili (kwa watu maalum na jamii)	
(1)	Hali ya malaria ikoje hapa Zanzibar?
(2)	Vipi Zanzibar inapamabana na malaria?
(3)	Unadhani mila/itikadi za watu zinazuia watu kupata tiba ya malaria?
(4)	Ni mila/itikadi gani zinawazuia watu kupata tiba ya malaria?
(5)	Unadhani mikakati ya kupamabana na malaria iliyopo hivi sasa inakubaliana na mila/itikadi?
(6)	Ni nini maoni yako kuhusu kuchanganya mila/itikadi na mikakati ya kupambana na malaria?
(7)	Ni mambo gani ya mila/itikadi huwarudisha nyuma watu katika kupata tiba ya malaria? Jee malaria inafikiriwa ni jambo la kuchukuliwa hadhari ipasavyo?
(8)	Jee jamii itakubali matibabu ya malaria iwapo tutatumia mila na desturi nzuri katika mikakati ya baadae kupambana na malaria?
(9)	Huwa unajuaje kama una malaria? Hukuchukua muda gani kutafuta matibabu?

Note. * = by cultural sensitivity this study refers to the level of awareness an intervention may have considered cultural barriers when planning, implementing, and conducting an intervention.

APPENDIX C

Interview Topics in English by general question area

(Q1)	What specific cultural practices hinder malaria treatment?
(Q2)	What cultural practices would keep people from seeking malaria treatment?
(Q3)	Do you think current interventions for malaria control can also be culturally sensitive?
(Q4)	What is your opinion about integrating culture with malaria interventions?
(Q5)	What culture issues would discourage individuals from seeking malaria treatment? Is malaria considered an issue to take care of right way?